PRE-CALCULUS HONORS

Summer Work and List of Topical Understandings

For students to successfully complete the objectives of the Pre-Calculus curriculum, the student must demonstrate a high level of independence, capability, dedication, and effort. This summer packet will help you maintain/improve your skills. ***This packet is a requirement for those entering the Pre-Calculus course and is due on the first day of class.*** Your attempt to complete this packet by the first day will be combined with an assessment on the material to form your first grade of the Pre-Calculus course. Feel free to use outside resources in your preparation for and completion of this packet, but be aware that you are required to demonstrate these skills on your own! **SHOW YOUR BEST WORK ON A SEPARATE SHEETS OF PAPER!**

Requirements

The following are guidelines for completing the summer work packet…

- ✓ Be sure all problems are neatly organized and all writing is legible.
- ✓ We expect you to come in with certain understandings that are prerequisite to Pre-Calculus. A list of these topical understandings is below.
- ✓ Students will also be required to complete an online assignment upon their return to school which will be graded as a summative grade in addition to the Summer Packet and corresponding in-class assessment.

These are the following skills that you will be required to understand in order to be successful in the coming year…

Skill 1: Fraction and Exponent Computation **Without** Calculator
Skill 2: Linear Equations
Skill 3: Systems of Equations
Skill 4: Polynomial, Rational and Radical Expressions
Skill 5: Laws of Exponents and Basic Logarithms
Skill 6: Graphing Functions and Transformations
Skill 7: Interval Notation, Inequality Notation, and Domain and Range
Skill 8: Special Right Triangles, Basic Trigonometry, Inverse Trigonometry
Skill 9: Completing the Square and Quadratic Inequalities
Skill 10: Polynomial Division and End Behavior
Skill 11: Properties of Logarithms and Solving Log and Exponential Equations

Recommended Timeline:

Week of July 16th: Skills 1 and 2
Week of July 23rd: Skills 3 and 4
Week of July 30th: Skills 5 and 6
Week of August 6th: Skills 7 and 8
Week of August 13th: Skills 9 and 10
Week of August 20th: Skill 11

West Essex Regional High School
Practice Set of Required Math Skills for
Pre-Calculus Honors

Skill 1:
All students should be able to complete operations involving fractions and recall exponent facts quickly and accurately ***without the use of a calculator***.

1. $\frac{1}{2}+\frac{1}{4}$ 2. $2\frac{2}{3}-\frac{5}{3}$ 3. $\frac{4}{5}\times\frac{20}{7}$ 4. $\frac{3}{5}\div\frac{1}{2}$

5. $\frac{16}{3}\div 2$ 6. $\frac{5}{7}\div 2$ 7. $5\times\frac{1}{15}$ 8. $\frac{7}{16}+\frac{1}{20}$

9. $2+\frac{1}{3}-\frac{1}{2}$ 10. $\left(\frac{3}{4}\right)^{2}$ 11. $\left(\frac{3}{2}\right)^{-1}$ 12. $\left(\frac{5}{7}\right)^{0}$

13. 8^2 14. 5^3 15. 6^{-3} 16. 2^5

17. -3^4 18. $(-3)^{-4}$ 19. 2×3^3 20. $(-2)^{-6}$

21. $(2-5)^3$ 22. $x^4 = 16$ 23. $x^3 = -216.$ 24. $4^{x}=\frac{1}{64}$

Simplify:

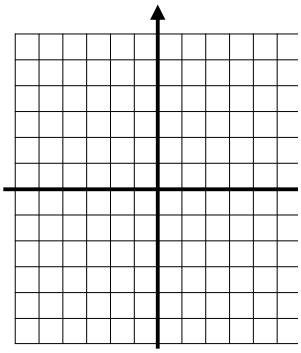
25. $\sqrt{300}$ 26. $\frac{\sqrt{192}}{2}$ 27. $\frac{18}{\sqrt{2}}$ 28. $\frac{\sqrt{3}}{2}\div\frac{1}{2}$

29. $\frac{4}{5+\sqrt{3}}$ 30. $\frac{5-\sqrt{7}}{3+\sqrt{2}}$

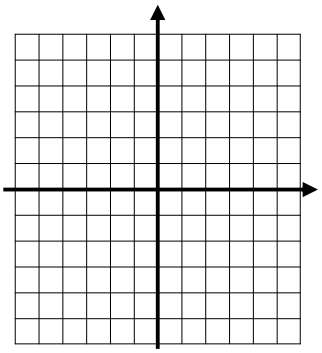
Skill 2:
All students should be familiar with all concepts of graphing linear equations in various forms, including graphically, in equations (slope-intercept, point-slope and standard form) and formulas, and numerically in a chart of ordered pairs.

Graph each of the following:

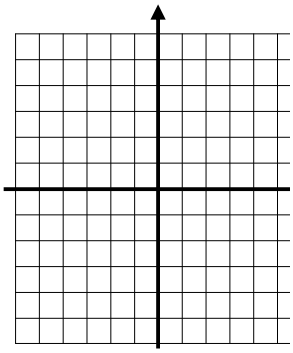
1. $f(x) = -\frac{4}{5}x - 1$



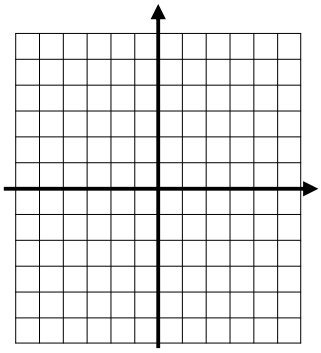
2. $y - 1 = 2(x - 4)$



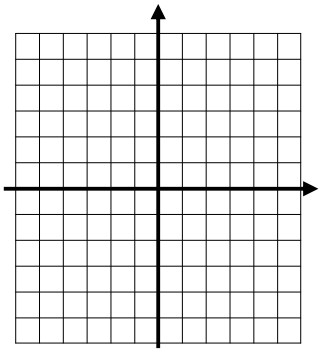
3. $y + 4 = -(x - 1)$



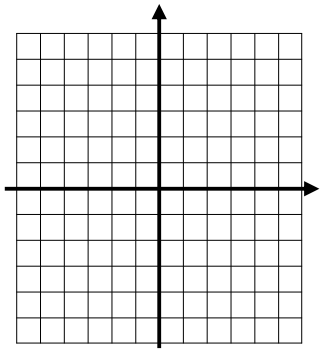
4. 4x – 3y = -12



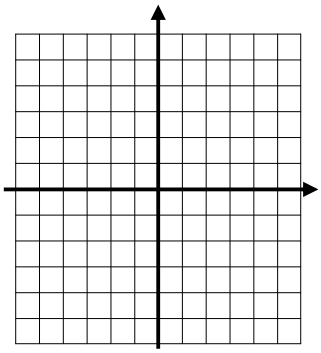
5. $x - y = 5$



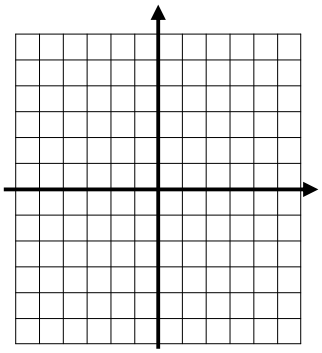
6. x = 4



7. $f(x) = -3$



8. $y + 4 = -\frac{1}{2}(x - 3)$



Find the slopes of the lines described.

9. The line passing through (-1, 6) and (4, -9).

10. The line $4x - 2y = 5$

11. The line with x intercept 3 and y intercept -2.

12. Any line parallel to $y = \frac{3}{4}x - 2$

13. Any line perpendicular to. $2y = 5x - 1$

14. Any horizontal line.

15. The line x = 0.

16. The line through (9, 1) and (9, -4).

Write the equation of each line indicated. Give answers in slope-intercept form for odds and point slope form for evens.

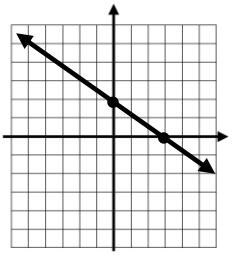
17. The line passing through (-1, 6) and (4, -9).

18. The line passing through (4, 2) and (-6, 2).

19. The line with x intercept 3 and y intercept -2.

20. The line parallel to $y = -2x + 2$ and containing (4, 1).

21. The line graphed below.



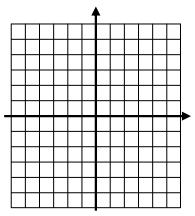
22. A linear function for which f(1) = 7 and f(-1) = 5.

23. A line perpendicular to $2y = 5x - 1$ passing through the origin.

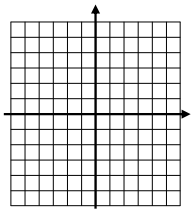
24. The line through (9, 1) and (9, -4).

Shade the half-plane that represents the solution to the linear inequality.

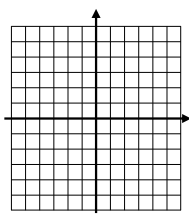
25. $y \geq 2x - 1$



26. $2x - 3y < -6$



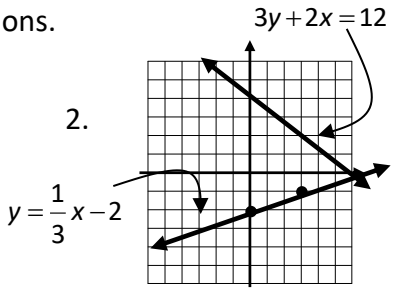
27. $x > 2$



Skill 3:

All students should be able to solve a system of equations.

1. $\begin{aligned} -3x+3y&=-18 \\ 4x-y&=5 \end{aligned}$

2. 

3. $\begin{aligned} 2x-3y&=8 \\ 5x+2y&=1 \end{aligned}$

Skill 4:

All students should be able to multiply, factor add and subtract polynomials and to use these skills to simplify expressions and solve equations involving quadratic, polynomial, and rational terms.

Factor:

1. $b^2+11b-26$
2. $t^2-17t+30$
3. x^2-81
4. $36m^2-25n^{12}$
5. $5x^2-7x-6$
6. $100x^2-75$
7. $3x^2-5x-2$
8. $9+8x-x^2$
9. x^3-64
10. $xy+xz-4y-4z$
11. $4x^2+8x+4$
12. $x^6+5x^3y^2-24y^4$

Add, subtract, multiply or divide.

13. $\left(3x^2y+2xy^2-7xy\right)-\left(-4x^2y-2xy^2+8xy\right)$
14. $(2x+1)^2$
15. $\left(3x^5-5yz^2\right)\left(3x^5+5yz^2\right)$
16. $(3x+1)^3$
17. $\dfrac{x}{4+y}-\dfrac{2x}{4+y}$
18. $\dfrac{2}{x^2+2x}+\dfrac{x}{4x+8}$
19. $\dfrac{2}{t}-\dfrac{4}{v}$
20. $\dfrac{5}{x^2-4}+\dfrac{3}{x-2}$
21. $\dfrac{\frac{x}{y}+\frac{1}{x}}{\frac{x^2+y}{xy}}$
22. $\dfrac{3x^2-5x-2}{\left(x^2-4\right)(6x+2)}$
23. $\dfrac{\frac{a}{8}-\frac{4}{a^2}}{4}$
24. $\dfrac{\frac{25}{12}+\frac{x+1}{4}}{\frac{1}{18}-\frac{x+1}{36}}$
25. $\dfrac{\frac{1}{2}-\frac{x+5}{4}}{\frac{x^2}{2}-\frac{5}{2}}$
26. $\dfrac{x-\frac{4}{x}}{x+\frac{10}{x+7}}$
27. $\dfrac{\frac{2}{x+1}-\frac{5}{x-2}}{\frac{3}{x-2}+\frac{2}{x}}$
28. $\dfrac{\frac{6x}{x^2+x-2}}{\frac{4}{x+2}-\frac{1}{x-1}}$

Solve. Where necessary, leave your answer in simplest radical form or as a + b***i***:

29. $3x(x-1)-x(x-8)=3$
30. $2x^2-7x=15$
31. $4x^2=20$
32. $x^2-14x+45=0$
33. $x^2-144=0$
34. $x^3-5x=0$
35. $x^2+4x+10=0$
36. $3x^2-8x-5=0$
37. $4x^2-7x+6=0$
38. $x^4-17x^2+16=0$
39. $6+2\sqrt{2x-5}=12$
40. $\sqrt{-2x+5}=x+5$
41. $\sqrt{144-x^2}=10$
42. $\sqrt{x^2+7}=x+1$

Skill 5:

All students should be able to apply the rules of exponents and evaluate basic logarithms. (Give answers with no negative exponents)

1. $x^8\cdot x^{n-3}$
2. $\left(\frac{49}{4}\right)^{-\frac{1}{2}}$
3. $\left(-2x^4\right)^3$
4. $\frac{y^{12}}{y^3}$
5. $\frac{y^{4+2x}}{y^2}$
6. $\frac{x^5y^{-3}}{w^0z^{-1}}$
7. $\frac{t^{-5}v^{-2}}{t^6v^{-7}}$
8. $\frac{x}{x^{-2}+y}$
9. $\frac{t^{-1}-v}{v}$
10. $(x+4)^2$
11. $(x-5)^{-2}$
12. $\frac{\left(-2x^{-3}\right)^2}{x^9}$
13. $\left(\frac{6}{5}\right)^{-3}$
14. $-\frac{1}{2x^{-2}}$
15. $\left(3x^{-3}\right)^{-2}$

Evaluate or Solve

16. $4\cdot3^2$
17. $2+3(1+2)^2$
18. $x^3=512$
19. $x^{\frac{3}{4}}=-8$
20. $2(1-x)^3=2{,}000$
21. $\log_x\sqrt{2}=\frac{1}{2}$
22. $2^{x+4}=4\cdot16^x$
23. $\frac{1}{27}=\frac{3^x}{9}$
24. $\log_2\frac{1}{32}$
25. $\left(\frac{2}{3}\right)^{x-2}=\left(\frac{9}{4}\right)^{2x-1}$
26. $3\cdot9^{2x+1}=27$
27. $\log_8 x=\frac{2}{3}$
28. $\log 10$
29. $\ln e^5$

Skill 6:
Students should be able to sketch graphs of non-linear functions, by using a table of values and through transformations.

Graphing: Sketch a graph, showing the coordinates of two or more important points or asymptotes.

1. $y = |x|$
2. $y = \frac{1}{x}$
3. $y = 2^x$
4. $y = e^x$
5. $y = \left(\frac{1}{3}\right)^x$
6. $y = x^2 + 4$
7. $y = (x+3)^2$
8. $y = -2x^2$
9. $y = 2(x-4)^2 - 1$
10. $y = x^2 - 4x + 3$
11. $y = 3(x+2)^2 - 5$
12. $y = (x-1)^2 + 3$
13. $y = 2x^2 - 12x + 16$
14. $y = 2 - |x+4|$

Skill 7:
Students will be able to express answers in interval notation and inequality notation. Students will also be able to determine the domain and range of a function and express it in terms of both notation styles.

Put the following in interval notation and graph the solution set on a number line.

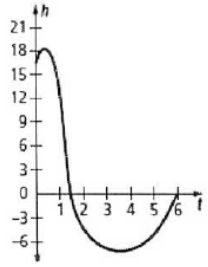
1. $-3 \le x < 4$
2. $x > 9$
3. $x > 12$ *or* $x \le -8$
4. $x \le 14$ *or* $x > 6$

Put the following into inequality notation and graph the solution set on a number line.

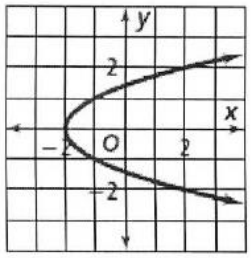
5. (2, 9]
6. (- ∞, 1)
7. (-3, 5] U [6, 10]
8. [-7, 1] U (6, ∞)

Given the pictured function below, write the domain and range in interval notation.

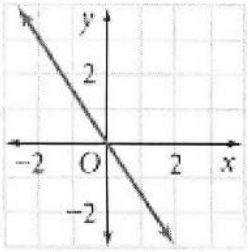
9.



10.



11.

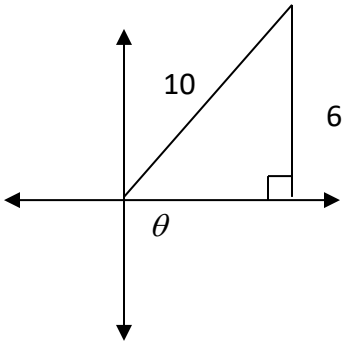


For #12-14, simply find the domain of the function. Express your answer in inequality notation:

12. $f(x) = \sqrt{x+4}$
13. $f(x) = \frac{1}{x^2+4x+3}$
14. $f(x) = \sqrt{25 - x^2}$

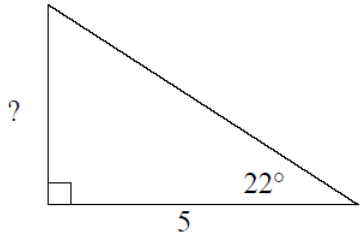
Skill 8:
Students should be familiar with special right triangles, right triangle trigonometry and inverse trigonometry.

1. Find sin θ, cos θ, and tan θ.

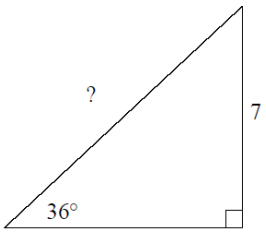


Find the value of indicated side using basic trigonometry. Round to two decimal places:

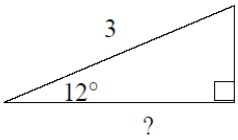
2.



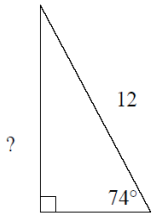
3.



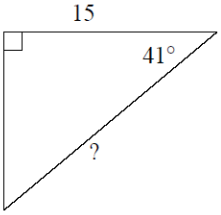
4.



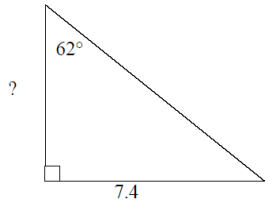
5.



6.



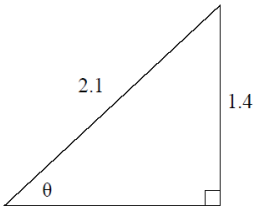
7.



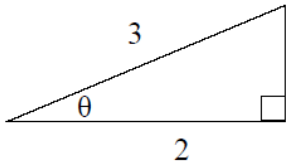
8. A damsel in distress locked in a high tower is being rescued by a mathematically gifted knight. He stands 25 feet from the base of the tower and measures the angle of elevation from the ground to the window where the damsel is to be 74°. Based on this information, determine how high up the damsel is in the tower and how long the ladder will have to be in order for the knight to reach her.

Use inverse trigonometry to determine the measure of the angle Round to one decimal place.

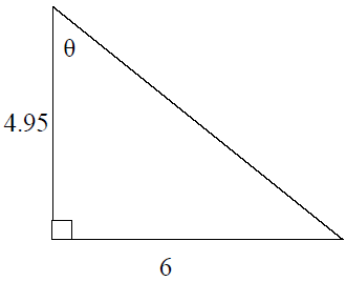
9.



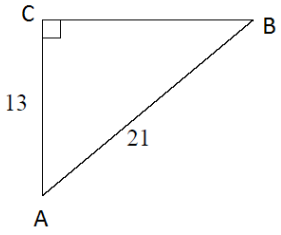
10.



11.

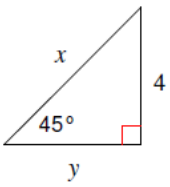


12. Solve the following triangle for all missing sides and angles. Round all values to one decimal place:

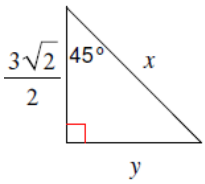


Find the value of the missing sides. Leave your answer in simplest radical form.

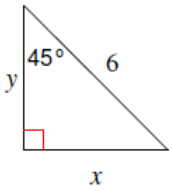
13.



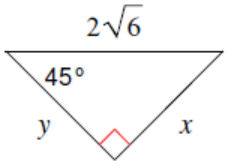
14.



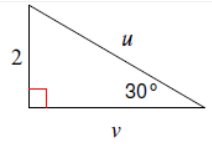
15.



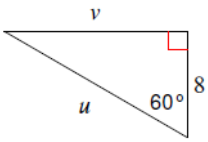
16.



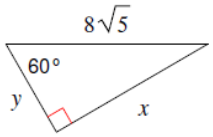
17.



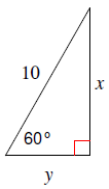
18.



19.



20.



Skill 9:
Students will be able to solve quadratic equations by completing the square. Students will also be able to solve and graph quadratic inequalities on a number line and on a plane.

Complete the square for each expression. Write the resulting expression as a binomial squared.

1. $x^2 + 14x + ?$
2. $x^2 - 12x + ?$
3. $x^2 - 9x + ?$

Solve each equation by completing the square.

4. $x^2 - 6x = -4$
5. $x^2 + 8 = 6x$
6. $2x^2 - 20x = 8$
7. $x^2 = 24 - 4x$
8. $10x + x^2 = 42$
9. $2x^2 + 8x - 15 = 0$

Write each parabolic equation in vertex form:

10. $h(x) = 3x^2 - 24x + 53$
11. $h(x) = x^2 + 8x - 10$
12. $g(x) = x^2 - 3x + 16$
13. $h(x) = 3x^2 - 12x - 4$

Using any method you choose, graph the quadratic inequalities on a number line.

14. $x^2 - x - 56 > 0$
15. $x^2 - 3x - 3 < 70$
16. $3x^2 \geq -4x - 1$
17. $x^2 \leq -4x + 12$
18. $x^2 - 3x > 18$
19. $x^2 + 3x \geq -2x - 4$

Using any method you choose, graph the quadratic inequalities on a plane.

20. $y > x^2 - 2x - 3$
21. $y \geq 2x^2 - x + 3$
22. $y \geq 2x^2 - 2x - 5$

Graph the system of quadratic inequalities.

23. $\begin{cases} y \geq x^2 - 4 \\ y < -x^2 - x + 2 \end{cases}$

24. $\begin{cases} y > x^2 - 6x + 9 \\ y < -x^2 + 6x - 3 \end{cases}$

Skill 10:

Divide the polynomial using long or synthetic division.

1. $(4x^2 + 3x - 7) \div (x - 2)$
2. $(x^5 + x^4 + x^3 + x^2 + 1) \div (x^2 - 1)$
3. $(x^4 + 9x^3 + 1) \div (x^2 + x + 1)$
4. $(-6x^2 + 5x - 10) \div (x + 7)$
5. $(6x^5 - 3x^2 + x - 2) \div (x - 1)$
6. $(-x^4 - 7x^3 + 6x^2 - 1) \div (x - 3)$
7. $(x^4 - 3x^3 + 2x - 5) \div (x^2 - x + 1)$
8. $(3x^3 + 4x^2 + x + 7) \div (x^2 + 1)$
9. $(x^3 + 13x^2 + 39x + 46) \div (x + 9)$
10. $(x^3 - 43x + 42) \div (x^2 + 6x - 7)$

State the end behavior of the polynomial.

11. $f(x) = 3x^4 - 7x^3 - 13$
12. $f(x) = -2x^3 + 3x^2 + 4x + 1$
13. $f(x) = 3x^2(x - 1)^2(x + 2)$
14. $f(x) = -x^2(x + 7)(x - 3)$

Skill 11:

CONDENSE each log expression:

1. $\log 8 + \log y$
2. $\log x - \log 5$
3. $\log 7 + 2\log x$
4. $\log y + \log x + \log 3$
5. $3\log y - 2\log x$
6. $\log 6 + 2\log x - \log 7$

EXPAND each log expression:

7. $\log 3x$
8. $\log x^3$
9. $\log \frac{x}{3}$
10. $\log \frac{y^2}{5}$
11. $\log \frac{3x}{4}$
12. $\log(5p)^3$

SOLVE each equation:

13. $4 = 15 - e^{x-8}$
14. $29 + 10^{t+12} = 74$
15. $\ln(x-1) = 3$
16. $2 = \log(4t)$
17. $\log_4(x+3) = \frac{1}{2}$
18. $\log(t+3) + \log(t) = 1$
19. $1 = \log_4 2 + \log_4(3+x)$
20. $-2 = \log(2) - \log(3+x)$
21. $\ln(4t) - \ln(3t) = 2$
22. $\log_2(t+1) - \log_2(t-1) = 3$
23. $\log_2(-x) = 3 - \log_2(2-x)$

SOLVE each word problem. Round to the nearest hundredth if necessary:

24. Brad invested $2,400 in an account that pays four percent compounded continuously. How much will he have after 13 years?
25. Sally invested $2,300 in a bond that pays 14% interest semiannually. How long will it take for her investment to triple?
26. A certain material decays at a rate of 1.9% per year. The sample is 260 grams. How much will be left in 11 years? How long will it take to have only a 100g sample left?
27. Amy bought a diamond ring for $6,000. If the value of the ring increases at a constant rate of 5.8% per year, how much will the ring be worth in twenty-one years?
28. A bacteria population doubles every eight minutes. If the population begins with one cell, how long will it take to grow to 512 cells?
29. Greg bought a gold coin for $9,000. If the value of the coin increases at a constant rate of 12% every 5 years, how many years will it take for the coin to be worth $20,000?
30. Albert currently pays a $400 premium for health insurance. If the premium increases at an annual rate of 2.5% per year, how many years will it take for the premium to be $800?

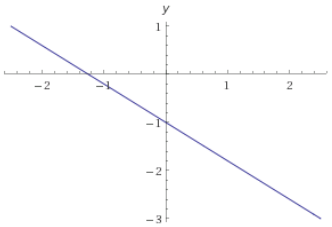
Pre-Calculus Honors Summer Packet Answers

Skill 1

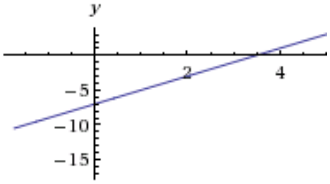
1. ¾
2. 1
3. $\frac{16}{7}$
4. $\frac{6}{5}$
5. $\frac{8}{3}$
6. $\frac{5}{14}$
7. $\frac{1}{3}$
8. $\frac{39}{80}$
9. $\frac{11}{6}$
10. $\frac{9}{16}$
11. $\frac{2}{3}$
12. 1
13. 64
14. 125
15. $\frac{1}{216}$
16. 32
17. -81
18. $\frac{1}{81}$
19. 54
20. $\frac{1}{64}$
21. -27
22. $x = \pm 2$
23. $x = -6$
24. x = -3
25. $10\sqrt{3}$
26. $4\sqrt{3}$
27. $9\sqrt{2}$
28. $\sqrt{3}$
29. $\frac{10-2\sqrt{3}}{11}$
30. $\frac{15-5\sqrt{2}-3\sqrt{7}+\sqrt{14}}{7}$

Skill 2

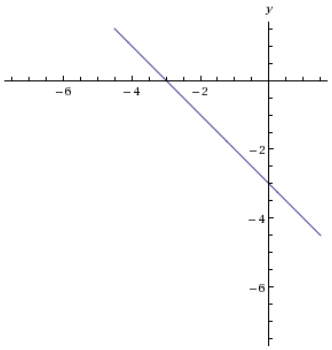
1.



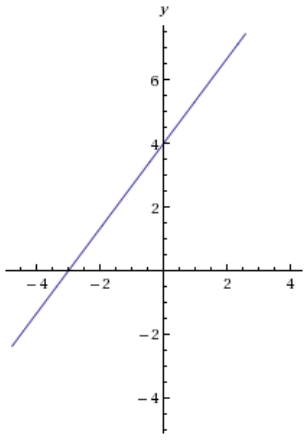
2.



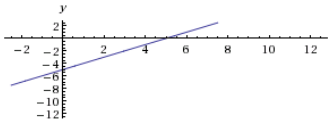
3.



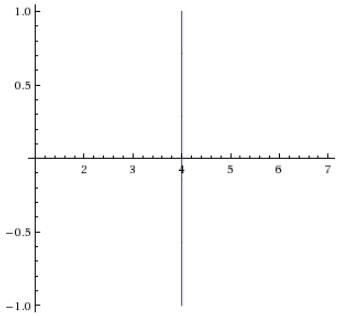
4.



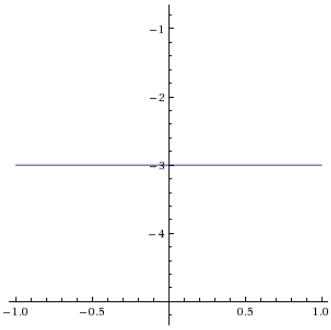
5.



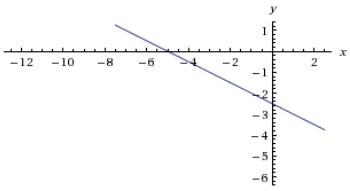
6.



7.

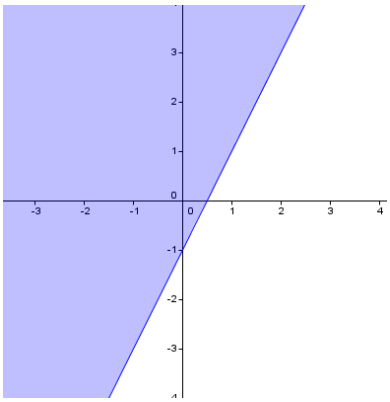


8.

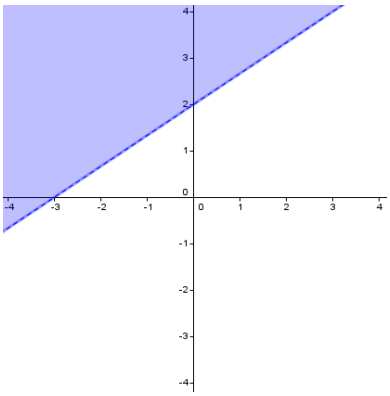


9. m = -3
10. m = 2
11. $m = \frac{2}{3}$
12. $m = \frac{3}{4}$
13. $m = -\frac{2}{5}$
14. $m = 0$
15. Undefined
16. Undefined
17. $y = -3x + 3$
18. y – 2 = 0
19. $y = \frac{2}{3}x - 2$
20. $y - 1 = -2(x - 4)$
21. $y = -\frac{2}{3}x + 2$
22. $y - 7 = x - 1$
23. $y = -\frac{2}{5}x$
24. $0 = x - 9$

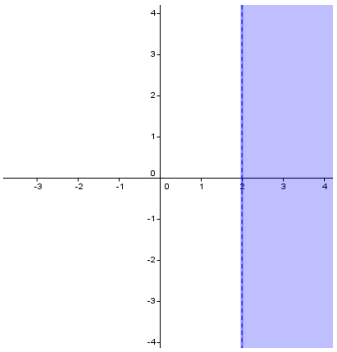
25.



26.



27.



Skill 3

1. $\left(-\frac{1}{3}, -\frac{19}{3}\right)$
2. (6, 0)
3. (1, -2)

Skill 4

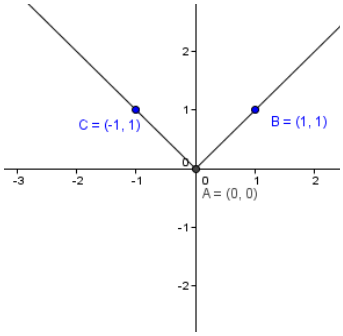
1. $(b+13)(b-2)$
2. $(t-2)(t-15)$
3. $(x+9)(x-9)$
4. $(6m-5n^6)(6m+5n^6)$
5. $(5x+3)(x-2)$
6. $25(4x^2-3)$ however… $25(2x-\sqrt{3})(2x+\sqrt{3})$ is acceptable
7. $(3x+1)(x-2)$
8. $-(x-9)(x+1)$
9. $(x-4)(x^2+4x+16)$
10. $(x-4)(y+z)$
11. $4(x+1)^2$
12. $(x^3+8y^2)(x^3-3y^2)$
13. $7x^2y+4xy^2-15xy$
14. $4x^2+4x+1$
15. $9x^{10}-25y^2x^4$
16. $27x^3+27x^2+9x+1$
17. $\frac{-x}{4+y}$
18. $\frac{x^2+8}{4x(x+2)}$
19. $\frac{2v-4t}{vt}$
20. $\frac{3x+11}{(x+2)(x-2)}$
21. 1
22. $\frac{1}{2(x+2)}$
23. $\frac{a^3-32}{32a^2}$
24. $\frac{3(3x+28)}{1-x}$
25. $\frac{-(x+3)}{2(x^2-5)}$
26. $\frac{(x-2)(x+7)}{x(x+5)}$
27. $\frac{-3x(x+3)}{(x+1)(5x-4)}$
28. $\frac{2x}{x-2}$
29. x = -3 or x = ½
30. $x=-\frac{3}{2}\ or\ x=5$
31. $x=\pm\sqrt{5}$
32. x = 5 or x = 9
33. $x=\pm12$
34. $x=0\ or\ x=\pm\sqrt{5}$
35. $x=-2\pm i\sqrt{6}$
36. $\frac{4\pm\sqrt{31}}{3}$
37. $\frac{7\pm i\sqrt{47}}{8}$
38. $x=\pm4\ or\ x=\pm1$
39. x = 7
40. x = -2
41. $x=\pm2\sqrt{11}$
42. x = 3

Skill 5

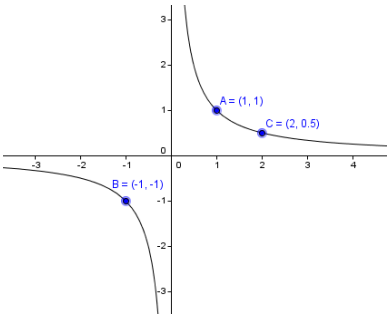
1. x^{n+5}
2. $\frac{2}{7}$
3. $-8x^{12}$
4. y^9
5. y^{2+2x}
6. $\frac{x^5z}{y^3}$
7. $\frac{v^5}{t^{11}}$
8. $\frac{x^3}{1+x^2y}$
9. $\frac{1-vt}{vt}$
10. $x^2+8x+16$
11. $\frac{1}{x^2-10x+25}$
12. $\frac{4}{x^{15}}$
13. $\frac{125}{216}$
14. $-\frac{x^2}{2}$
15. $\frac{x^6}{9}$
16. 36
17. 29
18. 8
19. 16
20. x = -9
21. x = 2
22. $x=\frac{2}{3}$
23. $x=-1$
24. -5
25. $x=\frac{4}{5}$
26. $x=0$
27. x = 4
28. 1
29. 5

Skill 6

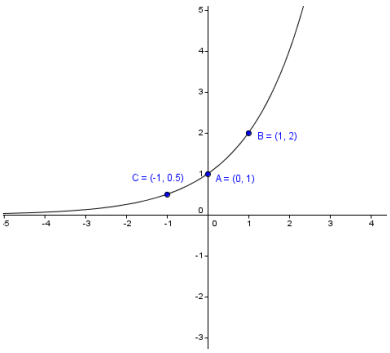
1.



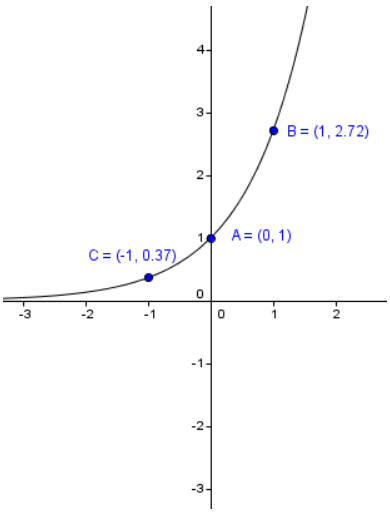
2.



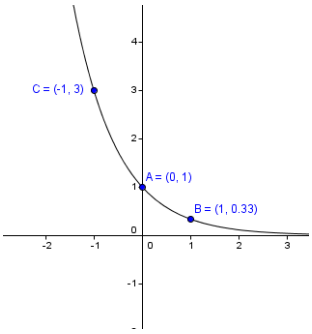
3.



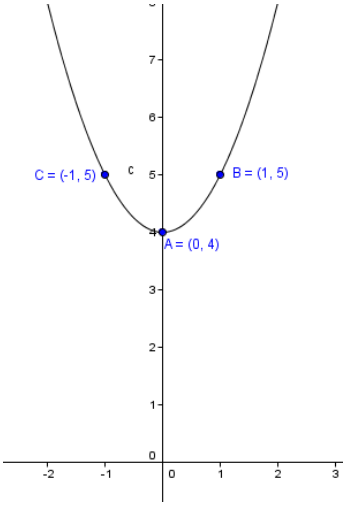
4.



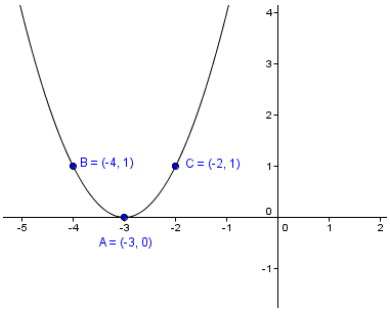
5.



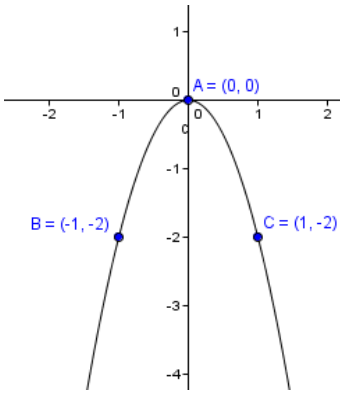
6.



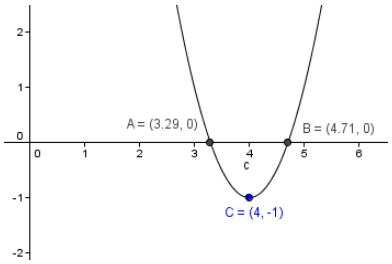
7.



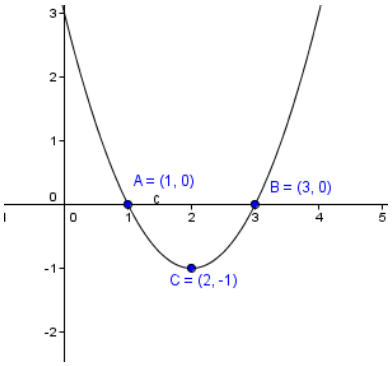
8.



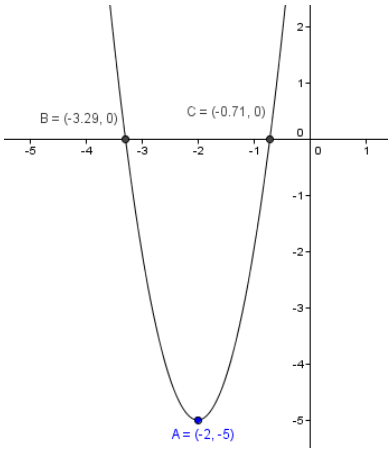
9.



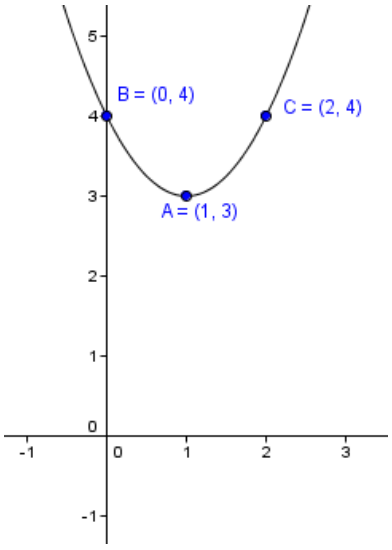
10.



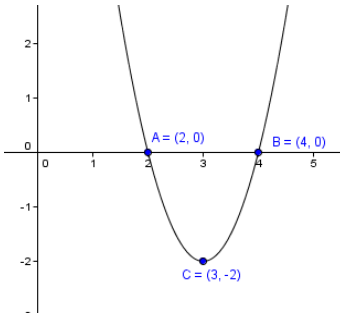
11.



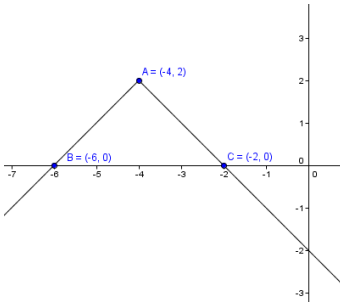
12.



13.

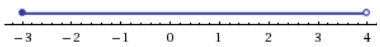


14.



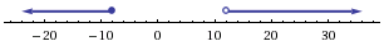
Skill 7

1. [-3, 4)

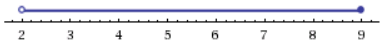


2. (9, ∞)

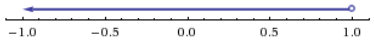
3. (-∞, -8] U (12, ∞)



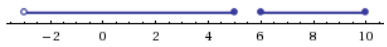
4. (-∞, ∞)
5. $2 < x \leq 9$



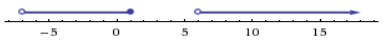
6. $x < 1$



7. $-3 < x \leq 5$ *or* $6 \leq x \leq 10$



8. $-7 \leq x \leq 1$ *or* $x > 6$



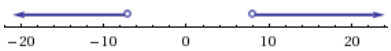
9. Domain: [0, 6]
   Range: [-6, 18]
10. Domain: [-2, ∞)
    Range: (-∞, ∞)
11. Domain: (-∞, ∞)
    Range: (-∞, ∞)
12. $x \geq 4$
13. $x \neq -3$ *or* $x \neq -1$
14. $-5 \leq x \leq x$

Skill 8:

1. $\sin\theta = \frac{3}{5}$
   $\cos\theta = \frac{4}{5}$
   $\tan\theta = \frac{3}{4}$
2. 2.02
3. 11.91
4. 2.93
5. 11.54
6. 19.88
7. 3.93
8. 87.18 feet is damsel's height, 90.7 feet is the length of the necessary ladder.
9. 41.8°
10. 48.2°
11. 50.5°
12. CB = 16.5, m<A = 51.8°, m<B = 38.2°
13. $x = 4\sqrt{2}, y = 4$
14. $x = 3, y = \frac{3\sqrt{2}}{2}$
15. $x = 3\sqrt{2}, y = 3\sqrt{2}$
16. $x = 2\sqrt{3}, y = 2\sqrt{3}$
17. $u = 4, v = 2\sqrt{3}$
18. $u = 16, v = 8\sqrt{3}$
19. $x = 4\sqrt{15}, y = 4\sqrt{5}$
20. $x = 5\sqrt{3}, y = 5$

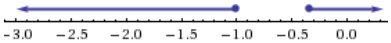
Skill 9:

1. $(x+7)^2$
2. $(x-6)^2$
3. $\left(x - \frac{9}{2}\right)^2$
4. $x = 3 \pm \sqrt{5}$
5. $x = 2$ *or* $x = 4$
6. $x = 5 \pm \sqrt{29}$
7. $x = -2 \pm 2\sqrt{7}$
8. $x = -5 \pm \sqrt{67}$
9. $x = -2 \pm \sqrt{\frac{23}{2}}$
10. $f(x) = 3(x-4)^2 + 5$
11. $f(x) = (x+4)^2 - 26$
12. $f(x) = \left(x - \frac{3}{2}\right)^2 + \frac{55}{4}$
13. $f(x) = 3(x-2)^2 - 16$
14. x > 8 or x < -7

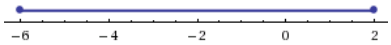


15. $\frac{3-\sqrt{301}}{2} < x < \frac{3+\sqrt{301}}{2}$

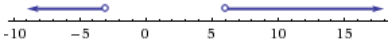
16. $x \geq -\frac{1}{3}$ *or* $x \leq -1$



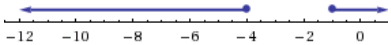
17. $-6 \leq x \leq 2$



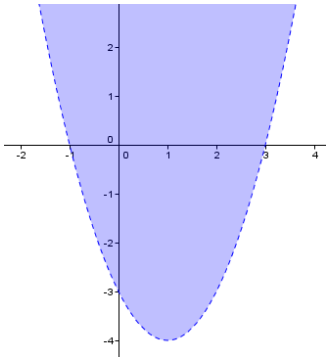
18. x > 6 or x < -3



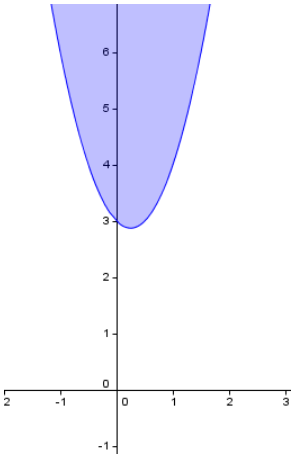
19. $x \geq -1$ *or* $x \leq -4$



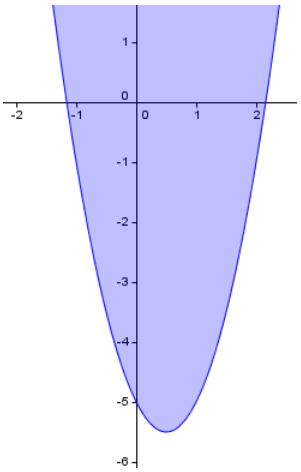
20.



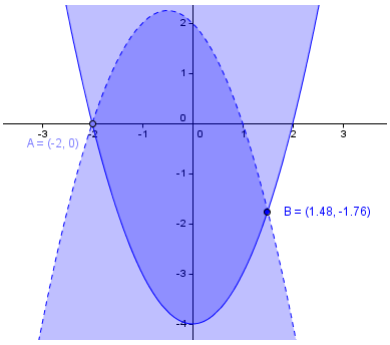
21.



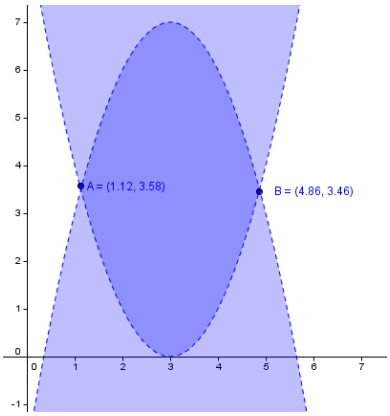
22.



23.



24.



Pictured values incorrect
They should be:
A (1.27, 3) and B (4.73, 3)

Skill 10:

1. $4x+11+\dfrac{15}{x-2}$
2. $x^3+x^2+2x+2+\dfrac{2x+3}{x^2-1}$
3. $x^2+8x-9+\dfrac{x+10}{x^2+x+1}$
4. $-6x+47-\dfrac{339}{x+7}$
5. $6x^4+6x^3+6x^2+3x+4+\dfrac{2}{x-1}$
6. $-x^3-10x^2-24x-72-\dfrac{217}{x-3}$
7. $x^2-2x-3+\dfrac{x-2}{x^2-x+1}$
8. $3x+4+\dfrac{-2x+3}{x^2+1}$
9. $x^2+4x+3+\dfrac{19}{x+9}$
10. x-6
11. $f(x)\to\infty \text{ as } x\to\infty,$ $f(x)\to\infty \text{ as } x\to-\infty$
12. $f(x)\to-\infty \text{ as } x\to\infty,$ $f(x)\to\infty \text{ as } x\to-\infty$
13. $f(x)\to\infty \text{ as } x\to\infty,$ $f(x)\to-\infty \text{ as } x\to-\infty$
14. $f(x)\to-\infty \text{ as } x\to\infty,$ $f(x)\to-\infty \text{ as } x\to-\infty$

Skill 11:

1. $\log 8y$
2. $\log\frac{x}{5}$
3. $\log 7x^2$
4. $\log(3xy)$
5. $\log\frac{y^3}{x^2}$
6. $\log\frac{6x^2}{7}$
7. $\log 3+\log x$
8. $3\log x$
9. $\log x-\log 3$
10. $2\log y-\log 5$
11. $\log 3+\log x-\log 4$
12. $3[\log 5+\log p]$
13. $x=8+\ln 11$
14. $t=-12+\log 45$
15. $x=1+e^3$
16. $t=25$
17. $x=-1$
18. $t=2$
19. $x=-1$
20. $x=197$
21. no solution
22. $t=\frac{9}{7}$
23. $x=-2$
24. $4036.87
25. 8.12 years
26. 210.54g, 49.81 years
27. $19604.25
28. 72 minutes
29. 35.23 years
30. 28.07 years