Summer Packet
Honors PreCalculus

Honors Pre-Calculus is a demanding course that relies heavily upon a student's algebra, geometry, and trigonometry skills. You are expected to know these topics before entering Honors Pre-Calc. You should be able to do 95% of this packet without a calculator! **All material on this packet will be assessed.**

DUE: 1st day of school

Pre-requisite topics:

- Linear functions (graphing, finding intercepts, writing equations, slope, parallel vs. perpendicular, etc.)
- Solving systems of linear and non-linear equations
- Quadratic functions (graphing, vertex vs. general form, solving equations, etc.)
- Functions (notation, domain and range, operations on functions, composition of functions, testing for functions, evaluating functions, finding intercepts, graphing, parent functions etc.)
- Dividing polynomials
- Factoring polynomials
- Rules of exponents
- Rules of radicals
- Complex numbers
- Right triangle trigonometry
- Pythagorean theorem
- Special right triangles
- Circles (graphing, finding the center and radius, standard form, etc.)
- Unit circle trigonometry
- Law of Sines and Law of Cosines
- Solving exponential and logarithmic equations
- Transformations of exponential and logarithmic equations

Each of these topics has been covered in your previous math classes and is considered pre-requisite material for this course. Example problems for each topic are included in the summer packet. Solutions to the packet will be provided upon returning to school. Extra review for each topic can also be found in your text book.

1. Find the x- and y- intercepts. Graph the function

$$4x - y = 8$$

X: _____   Y: _____
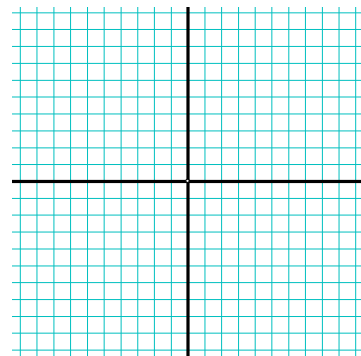
2. Are the points solutions to $4x - y = 8$? Justify.

   a)   (3, 4)   b) (-2, 6)
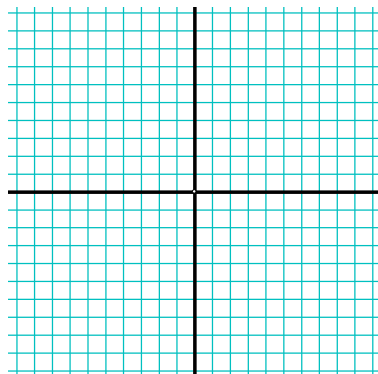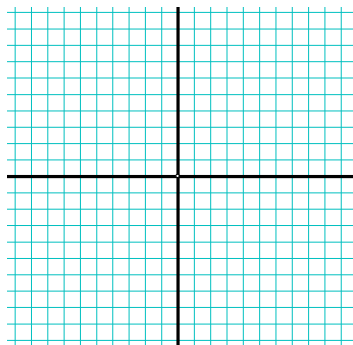
3. Find the slope of each line and graph.

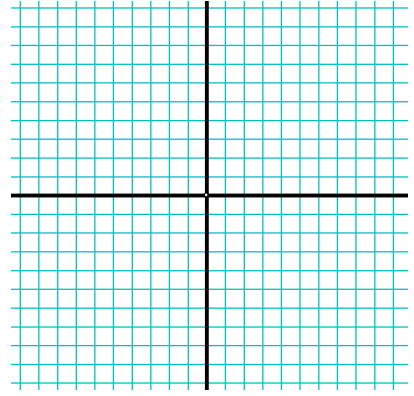   a) $y = -4$ m = _____   b) $x = 2$ m = _____

4. If the point $\left(-3, \frac{1}{2}\right)$ lies on the graph of the equation $2x + ky = -11$, find the value of k.

5. A line has equation $x + 2y = 5$. Find the slope of a line that is

   a) parallel   b) perpendicular

6. Put $7x + 9y = 18$ into slope intercept form and graph.

7. Find an equation in Standard Form of the line with x – intercept 5 and y-intercept 3.

8. Find an equation in Slope-Intercept Form of the line that goes through (8, 3) and (2, -1).

9. Find an equation in Standard Form of the line through (1, -4) that is perpendicular to the line $2x - y = 4$.

10. Find an equation in Standard Form for the perpendicular bisector of the segment joining (0, 3) and (-4, 5).

11. Use substitution to find all points of intersection of the graphs of $x - y = 2$ and $6x - 5y = 16$.

12. Use elimination to find all points of intersection of the graphs of $3x + 2y = 10$ and $2x + 5y = 3$.

13. Find all points of intersection of the system of $2x - y = -2$ and $4x - y = -6$ by graphing.
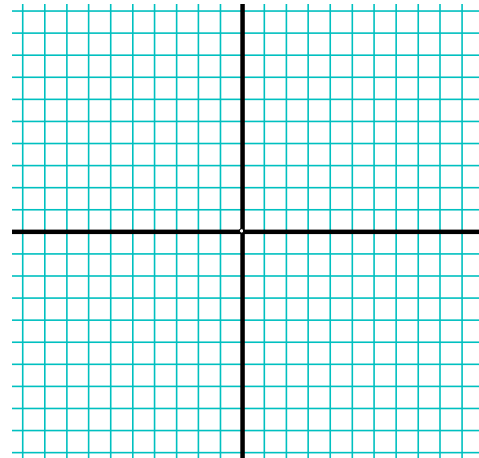
14. Solve each system of equations.

a) $\begin{aligned} x^2 + y &= 0 \\ x^2 - 4x - y &= 0 \end{aligned}$

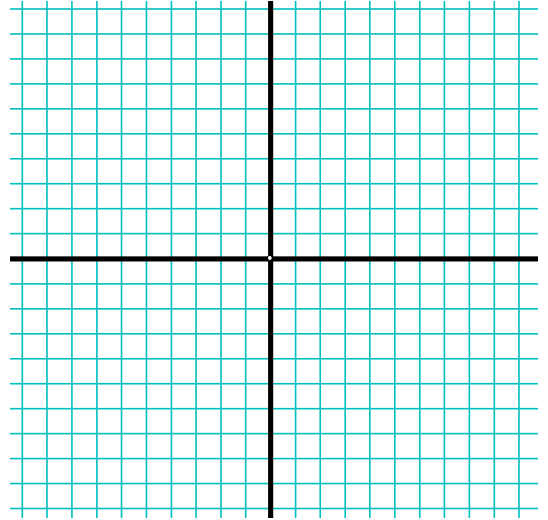b) $\begin{aligned} 2x - y + 3 &= 0 \\ x^2 + y^2 - 4x &= 0 \end{aligned}$

15. Without putting the parabola in vertex form, identify the vertex. Is the vertex a maximum or minimum?

a) $f(x) = 2x^2 + 8x + 7$

b) $y = -x^2 + 6x - 8$

16. Find the intercepts, zeros, axis of symmetry and vertex of the graph of $y = x^2 + 3x - 10$.

Graph the parabola.

17. Change into vertex form:

a) $f(x) = -x^2 + 6x - 8$

b) $f(x) = \frac{1}{4}x^2 - 2x - 12$

18. Simplify.

a) $\frac{1}{i^{23}}$

b) $(6 - 7i)^2$

c) $\frac{5 + 4i}{1 - 2i}$

d) $-\frac{16}{4 - 2i}$

19. Solve the quadratic. Solutions may be real or complex.

a) $x^2 - 2x + 2 = 0$

b) $\dfrac{2}{3}x^2 - 6x + 9 = 0$

20. Factor each expression.

a) $x^2 - xy + 2x - 2y$

b) $b^4 - 81$

c) $x^3 - 3x^2 - 54x$

d) $8m^3 - 125$

e) $2x^3y - x^2y + 5xy^2 + xy^3$

f) $6n^2 - 11n - 2$

g) $x^2 - 8x - 8$

h) $15a^2b - 10ab^2$

i) $2c^2 - 98$

j) $8a^2 + 2a - 6$

21. Divide
    a) Use synthetic division.

    $$\frac{5x^3+6x+8}{x+2}$$

    b) Use long division

    $$\frac{12x^3-19x^2-25x-10}{4x+3}$$

22. Find the x- and y-intercepts of the graph of the equation.

    a) $y=\sqrt{x+4}$

    b) $y=-|x+10|$

    c) $y=x^4-25$

    d) $y^2=x+1$

23. Find the domain and range of each:

    a) $y=3x-9$

    b) $y=-|x|+2$

    c) $y=2x^2+6x-7$

24. Let $f(x) = x^2 + 2x + 1$, $g(x) = x + 2$ and $h(x) = 4 - x^2$. Find:

a) $(g \circ h)(x)$

b) $(g(x))$

c) $f(x - 2)$

d) $(f - g)(x)$

e) $f(x + b)$

f) $(f \cdot g)(x)$

g) $\left(\dfrac{h}{g}\right)(x)$

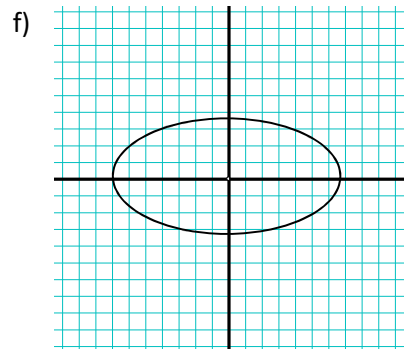25. Determine whether the relation determines a function.

a) A person and their birthday

b) $2x + 5y = 10$

c) $y = \sqrt{16 - x^2}$

d) $y = -75$

e) $y = |4 - x|$

f)

26. Evaluate each.

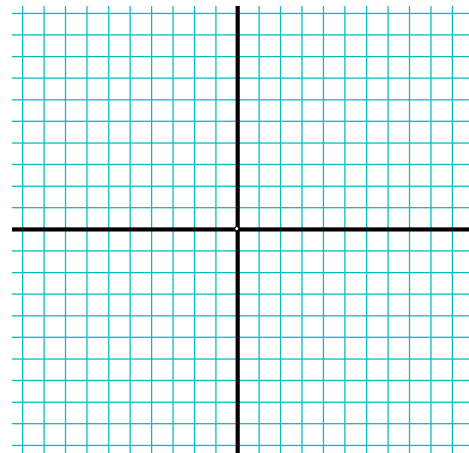a) Given $f(x) = 2 \cdot 3^x$, find $f(5)$.

b) Given $f(x) = \dfrac{1}{2} \cdot 2^x$, find $f(-3)$.

27. Simplify each

a) $\left(\dfrac{3^4 a^{-7} b^3 d^{-4}}{43^0 a^{-4} b^{-5} c^6} \right)^{-4}$

b) $\dfrac{x^{-2} - y^{-2}}{x^{-1} - y^{-1}}$

Change the following equations into the form $(x-h)^2 + (y-k)^2 = r^2$. Graph the functions.
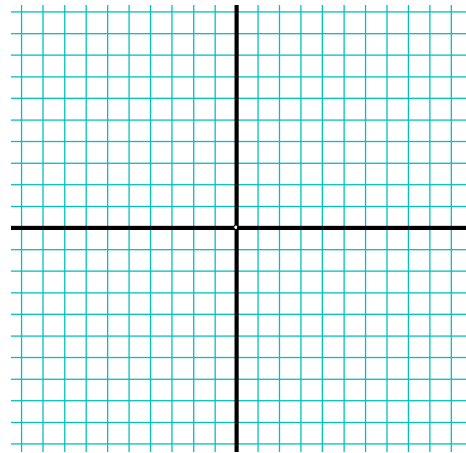
28. $x^2 + 14x + y^2 + 2y + 40 = 0$

Equation _____

Center _____

Radius _____

29. $4y^2 + 4x^2 - 4y - 4x - 7 = 0$

Equation_____

Center _____

Radius _____

30. Find the equation of a circle.

a) with center (2, -3) and point (5, 1)

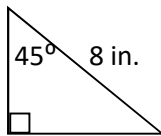b) with endpoints of the diameter at (-4,0) and (-4, -6)

31. In right triangle ABC, with angle B being the right angle,
    a)   If AB = 16 and m $\angle$ A = 53°, find BC   b) If AB = 36 and AC = 47, find m $\angle$ A

32. In right triangle ABC, with angle B being the right angle,
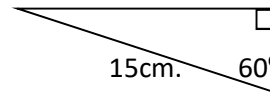
a)   If AB = 16 and m ∠ A = 53°, find BC

b) If AB = 36 and AC = 47, find m ∠ A

33. Solve for the unknown sides. No decimals.

a)

45°   8 in.

b)
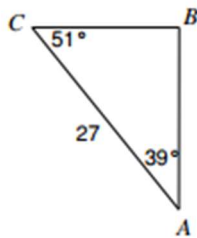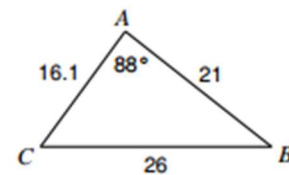
15cm.   60°

34. Find the unknowns.

a)   Find BC

C 51°   B

27

39°

A

b) Find $m\angle C$

A

16.1   88°   21

C   26   B

c) Find AB.

B

13

134°

A   12   C
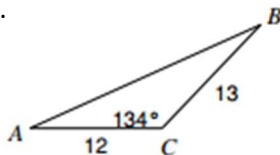
d) Given $\triangle ABC$ with $\angle B = 34^{\circ}$, b = 15cm,

and $c = 20cm.$, solve the triangle.

35. Convert each angle from radians to degrees.

a) $\dfrac{7\pi}{3}$

b) $-\dfrac{12\pi}{17}$

36. Convert each angle from degrees to radians in terms of pi.

a) 370°

b) -775°

37. Find a positive and negative co-terminal angle for each.

a) -500°

b) $\dfrac{7\pi}{3}$

38. Find the reference angle for each.

a) 700°

b) $-\dfrac{11\pi}{6}$

39. Find the exact value for each trig function without a calculator.

a) $\sin 225°$

b) $\cos(-30°)$

c) $\tan 120°$

d) $\sin \dfrac{5\pi}{3}$

e) $\cos\left(-\dfrac{5\pi}{4}\right)$

f) $\tan \dfrac{13\pi}{6}$

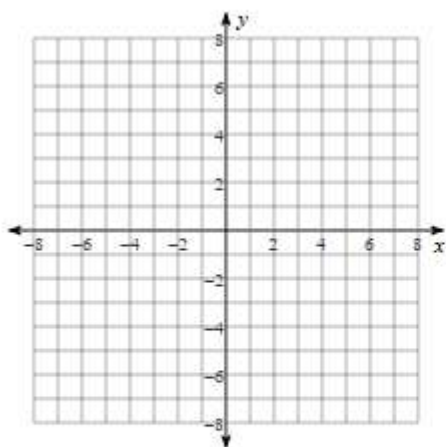g) $\sin 270°$

h) $\tan\left(\dfrac{\pi}{2}\right)$
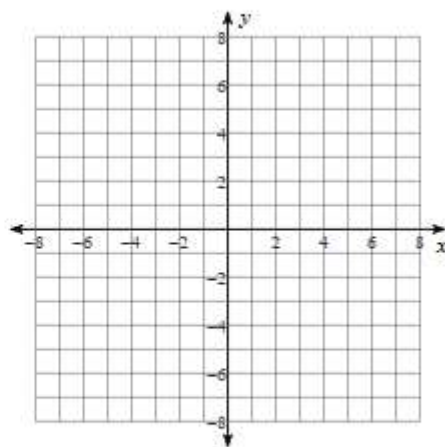
40. Graph each equation **without a calculator**:
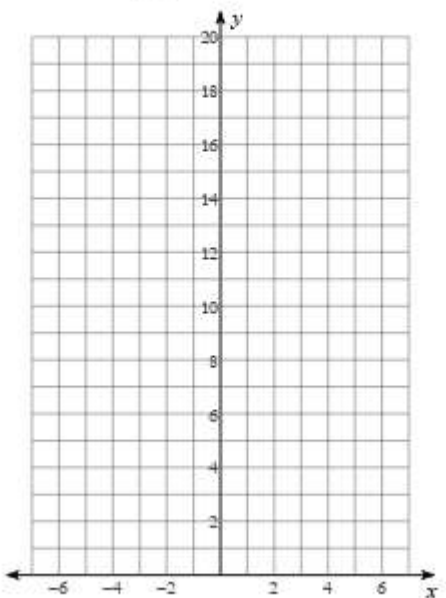
a)

$$y = \log_6(x-3) + 1$$

b)

$$y = \log_{\frac{1}{5}}(x-1) - 4$$
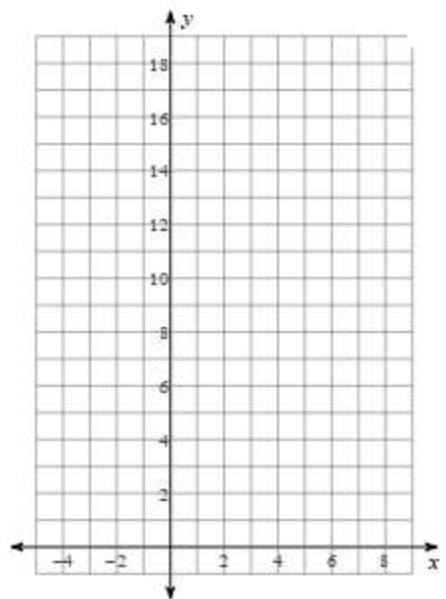
41. Graph each equation **without a calculator**:

a)

$$y = 3 \cdot \left(\frac{1}{2}\right)^x$$

b)

$$y = \frac{1}{3} \cdot 5^{x-2} - 1$$

42. Solve each equation

a) $2(3)^{2x} = 5$

b) $5\log(x-2) = 11$

c) $12 = 10^{x+5} - 7$

d) $\log_2 x = 5$

e) $3(5^{-x/4}) = 15$

f) $\log_6 x - \log_6(x+1) = 2$

g) $\log_5 x + \log_5(x+1) = \log_5 20$

h) $\left(\dfrac{1}{16}\right)^x = 64$

i) $\ln(x^2+3) - \ln 2 = \ln 26$

j) $\ln x - \ln(x+2) = 2$

k) $-e^{p-4} = -15$

l) $-8 \cdot 6^{7.3-6p} = -8$

m) $9e^{-8x} - 10 = 36.5$

n) $-4.5e^{-9.1a-1} + 8 = -20$

43. Rewrite as a single log $\log 2x + \dfrac{1}{2}\log 4 - \log 4x$

44. Expand: $\log_7 \dfrac{49x^2 y^3}{w^8 \sqrt{z}}$

45. Graph, name and state the domain and range of each of these functions.
Each graph should have a minimum of four points.

$$f(x) = x$$

$$f(x) = x^2$$

$$f(x) = x^3$$

$$f(x) = \sqrt{x}$$

$$f(x) = |x|$$

$$f(x) = \frac{1}{x}$$