Sections 2.1 & 2.2 - I.C.E. **Name:** _____

SHOW ALL WORK!!!! ☺

Assume you cannot use a graphing calculator for these problems.
The ones on which you CAN use a graphing calculator are starred.

For questions 1 and 2, determine the left hand and right hand behavior of the graph of function. Fill in the blank with the appropriate sign (positive or negative)

1. $y = 3x^4 - 2x^3 + x$

   as $x \to \infty$, $y \to$ ___ ∞

   as $x \to -\infty$, $y \to$ ___ ∞

2. $y = 5x^5 - 6x + 3$

   as $x \to \infty$, $y \to$ ___ ∞

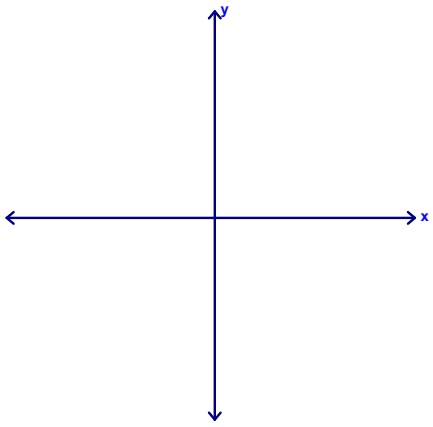
   as $x \to -\infty$, $y \to$ ___ ∞

3. $f(x) = -(x^2 + x - 30)$ (for vertex, use $h = \frac{-b}{2a}$ and $k = f(h)$)

   a) Vertex:

   b) x-intercepts:

   c)

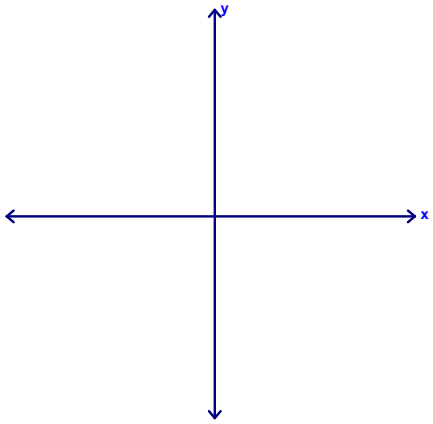


4. $f(x)=x^2+12x+16$ (find the vertex by completing the square)

   a) Vertex:

   b) x-intercepts:

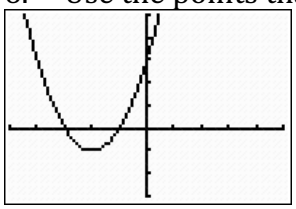
   c)



For questions 5 and 6, give the equations, in vertex form, for the following graphs.

5. Vertex: $\left(\frac{5}{2},-\frac{3}{4}\right)$, passing through (-2, 4)

6. Use the points that are most clear on this graph:

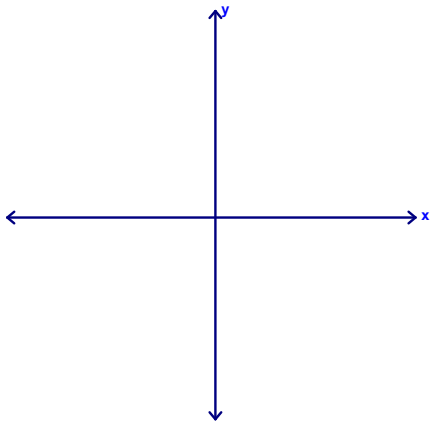


7. $f(x) = x^3 - 6x^2 + 9x$

   a) find the zeros and determine the multiplicity of each zero

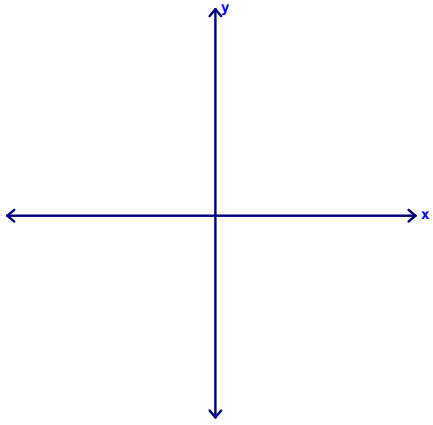
   b) determine the left/right hand behavior for the polynomial

   c) use this information to sketch a graph.



8. Find a polynomial of degree n that has the given zeros and then draw a sketch of your polynomial. You may leave it in factored form: you do not need to FOIL it out. (Many correct answers)

   Zeros: x = -2, 4, 7 Degree: n = 3



9. Find a quadratic function **in standard form** whose graph has the given x – intercepts. (Many answers)

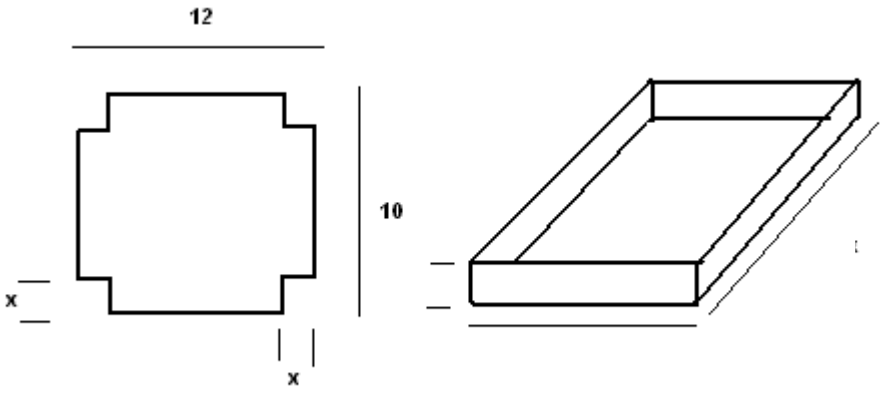
   x-intercepts: (-2, 0) and (4, 0)

10. Write a quartic polynomial, $P(x)$, **in standard form** with the following conditions:

    Zero at solutions at 1 (multiplicity 2),
    Zeros at $\sqrt{7}$ (multiplicity 1) and $-\sqrt{7}$ (multiplicity 1)
    y-intercept at (0,21)

*11. The path of a diver is $y=-\frac{4}{9}x^2+\frac{24}{9}x+12$ where y is the height (in feet) and x is the horizontal distance from the end of the diving board (in feet). What is the maximum height of the diver? (Do the work algebraically, then confirm graphically)

*12. An open box with locking tabs is to be made from a square piece of material 12 inches on one side and 10 inches on the other, and this is to be done by cutting equal squares with side length x from the corners and folding up the sides.



a) What is the volume of the box in terms of x? (you can leave in factored form)

$V(x) =$

b) What is the domain of the function V?
(in other words, what values of x make this a box that can actually be built?)

c) Sketch a graph of the function and find the value of x that will give the maximum volume:
(be sure to adjust your window so you can see the WHOLE graph!)

d) Use your calculator to find the following information:

Max volume will happen at x = _____

Maximum volume is _____

*13. Standish throws a softball; the table below shows the height ($h(t)$) of the ball t seconds after it is thrown. Give the quadratic regression equation that best fits the data. Round the coefficients to three decimals.

t	0.35	0.5	1
$h(t)$	8	9.2	7.5

Quadratic model: $h(t) =$