

## Review 2.1-2.3

Write an equation for the linear function  $f$  satisfying the given conditions.

$$f(-5) = -1 \text{ and } f(2) = 4$$

$$(-5, -1) \quad \boxed{(2, 4)}$$

$$\text{slope} = \frac{4 - (-1)}{2 - (-5)} = \frac{5}{7}$$

$$y = mx + b$$

$$4 = \frac{5}{7}(2) + b$$

$$4 = \frac{10}{7} + b$$

$$-\frac{10}{7} \qquad -\frac{10}{7}$$

$$4 - \frac{10}{7} = b \qquad \frac{(7)4}{(7)1} - \frac{10}{7} = \frac{28}{7} - \frac{10}{7} = \frac{18}{7}$$

$$y = \frac{5}{7}x + \frac{18}{7}$$

Write an equation for the linear function  $f$  satisfying the given conditions.

$$f(-5) = -1 \text{ and } f(2) = 4$$

$$(-5, -1) \quad \boxed{(2, 4)}$$

$$\text{slope} = \frac{-1 - 4}{-5 - 2} = \frac{-5}{-7} = \frac{5}{7}$$

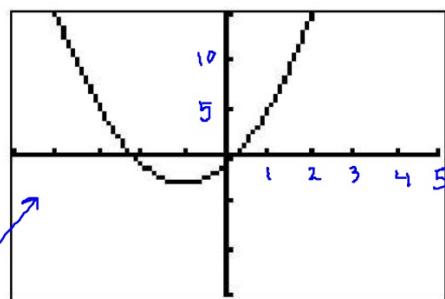
$$y = y_1 + m(x - x_1)$$

$$y = 4 + \frac{5}{7}(x - 2)$$

Match the graph with the function

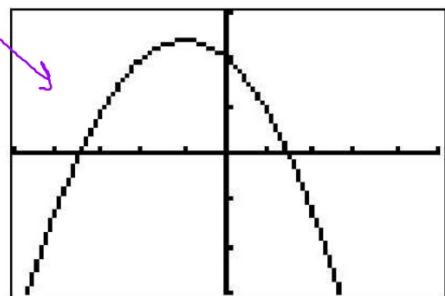
$$1) f(x) = 12 - 2(x + 1)^2$$

up 2  
opens down  
vertical stretch (narrower)  
left + 1



$$2) f(x) = 2(x + 1)^2 - 3$$

Vertical Stretch  
left + 1  
down 3



Find the vertex and axis of symmetry.

$$f(x) = 3(x - 1)^2 + 5$$

*right 1*  
*up 5*

vertex:  $(1, 5)$

axis symmetry:  $x = 1$

Rewrite the function in vertex form. Then find the vertex and axis of symmetry. Then find the x-intercepts of the graph.

Completing the square  
Quadratic Formula

$$f(x) = -3x^2 + 6x - 5$$

$$\begin{aligned}y &= -3x^2 + 6x - 5 \\&\quad + 5 \\ \hline y + 5 &= -3x^2 + 6x\end{aligned}$$

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

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

$$(-3)\frac{y}{-3} + (-3)\frac{5}{-3} + 1^{(-3)} = -3(x-1)^2$$

$$y + 5 - 3 = -3(x-1)^2$$

$$y - 2 = -3(x-1)^2$$

$$y = -3(x-1)^2 - 2$$

vertex  $(1, -2)$

axis:  $x = 1$

Rewrite the function in vertex form. Then find the vertex and axis of symmetry. Then find the x-intercepts of the graph.

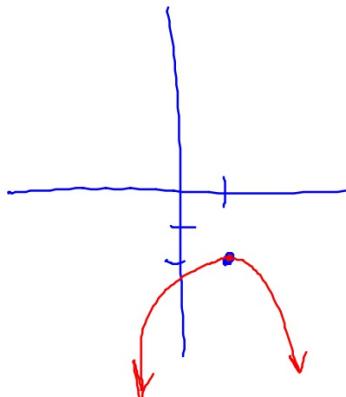
$$f(x) = -3x^2 + 6x - 5 \quad x = \frac{-b}{2a} \pm \frac{\sqrt{b^2 - 4ac}}{2a}$$

$$a = -3 \quad b = 6 \quad c = -5$$

$$x = \frac{-6}{2(-3)} \pm \frac{\sqrt{6^2 - 4(-3)(-5)}}{2(-3)}$$

$$x = \frac{-6}{-6} \pm \frac{\sqrt{36 - 60}}{-6}$$

$$x = 1 \pm \frac{\sqrt{-24}}{-6} \quad \text{No } x\text{-intercepts}$$



Rewrite the function in vertex form. Then find the vertex and axis of symmetry. Then find the x-intercepts of the graph.

$$f(x) = -3x^2 + 6x - 5$$

$$a = -3 \quad b = 6$$

$$x = -\frac{b}{2a} = -\frac{6}{2(-3)} = 1$$

vertex  $(1, -2)$

$$y = -3(1)^2 + 6(1) - 5$$

$$y = -3(1) + 6 - 5$$

$$y = -3 + 6 - 5$$

$$y = -2$$

$$\boxed{y = -3(x-1)^2 - 2}$$

Rewrite the function in vertex form. Then find the vertex and axis of symmetry. Then find the x-intercepts of the graph.

$$f(x) = -3x^2 + 6x - 5$$

$$y = -3(x-1)^2 - 2$$

$$\begin{array}{r} 0 = -3(x-1)^2 - 2 \\ + 2 \qquad \qquad \qquad + 2 \\ \hline 2 = -3(x-1)^2 \\ \frac{2}{-3} = \frac{-3(x-1)^2}{-3} \end{array}$$

$$\begin{aligned} \sqrt{\frac{2}{3}} &= \sqrt{(x-1)^2} \\ \pm \sqrt{\frac{2}{3}} &= x-1 \end{aligned} \qquad \text{No } x\text{-intercepts}$$

Write an equation for the quadratic function whose graph contains the given vertex and point.

Vertex  $(-2, -5)$  Point  $(-4, -27)$

$$y = a(x-h)^2 + k$$

$$y = a(x+2)^2 - 5$$

$$-27 = a(-4+2)^2 - 5$$

$$-27 = a(-2)^2 - 5$$

$$-27 = 4a - 5$$

$$\begin{array}{r} -27 = 4a - 5 \\ +5 \quad \quad \quad +5 \\ \hline -22 = 4a \end{array}$$

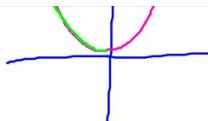
$$\frac{-11}{2} = a$$

$$a = \frac{\Delta y}{(\Delta x)^2}$$

$$y = \frac{-11}{2}(x+2)^2 - 5$$

$$a = \frac{-5 - (-27)}{(-2 - (-4))^2} = \frac{22}{4}$$

## Analyze the function $y = 2x^4$



- 1) Determine the domain and range or undefined for  $x < 0$
- 2) Is the function even, odd

D:  $(-\infty, \infty)$

R:  $[0, \infty)$

even

- 3) Intervals of Increase or Decrease

Dec:  $(-\infty, 0)$  → Left side

Inc:  $(0, \infty)$  → Right side

- 5) Determine the end behavior

$$\lim_{x \rightarrow \pm\infty} f(x) = \infty$$

- 4) Find any extrema

Abs/Local minimum at  
 $x = 0$

- 6) Find any asymptotes

none

- 7) Intervals of Concavity (concave up  $(-\infty, \infty)$ )

Describe how to transform the graph of  $y = x^3$  into the function given

$$g(x) = \frac{3}{4}(x - 3)^3 + 1$$

vertical compression  
(wider)

right 3

up 1

y-intercept

$$y = \frac{3}{4}(0 - 3)^3 + 1$$
$$y = \frac{3}{4}(-3)^3 + 1$$
$$y = \frac{3}{4}(-27) + 1$$
$$y = -\frac{81}{4} + \frac{4}{4} = -\frac{77}{4}$$

For each graph find a) the zeros b) intervals of concavity

c) the degree of the polynomial

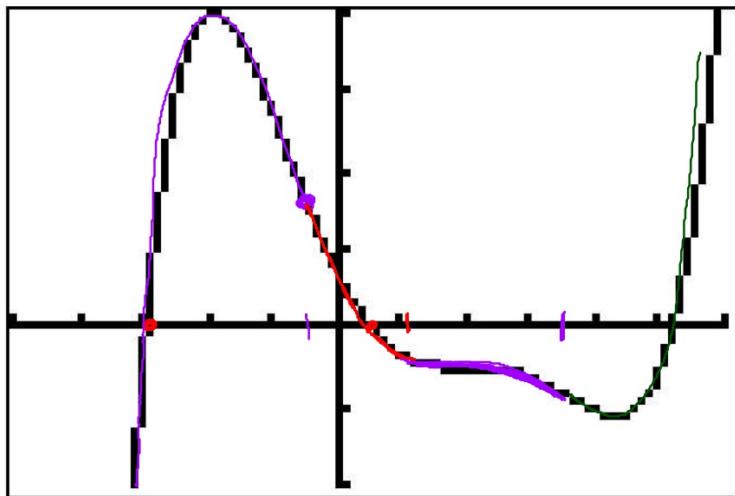
a)  $x = -2.9, .5, 5.2$

b)  $(-\infty, -0.5)$  concave down  
 $(-0.5, 1)$  concave up

$(1, 3.5)$  concave down  
 $(3.5, \infty)$  concave up

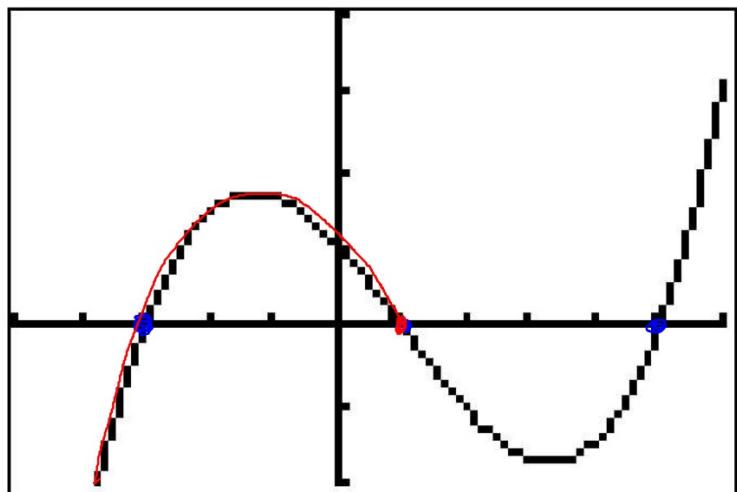
c) degree = 5

$$f(x) = x^5$$



For each graph find a) the zeros b) intervals of concavity  
c) the degree of the polynomial

a)  $x = -3, 1, 5$

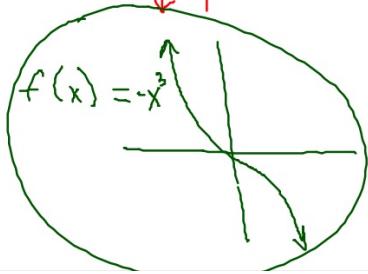
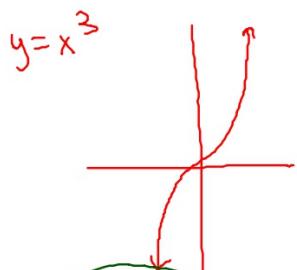


b)  $(-\infty, 0)$  concave down  
 $(0, \infty)$  concave up

c) degree = 3  
 $y = x^3$

Describe the end behavior of the polynomial function.

$$f(x) = \cancel{-x^3} + 7x^2 - 4x + 3$$



$$\lim_{x \rightarrow -\infty} f(x) = \infty$$

$$\lim_{x \rightarrow \infty} f(x) = -\infty$$

Find the zeros of the function algebraically

$$f(x) = 3x^3 - x^2 - 2x$$

$$0 = x(3x^2 - bx - 2)$$

$$0 = x(3x + 2)(x - 1)$$

$\begin{matrix} -3x + 2x \\ -1x \end{matrix}$

$$\boxed{x=0}$$

$$\begin{array}{r} 3x + 2 = 0 \\ -2 -2 \\ \hline 3x = -2 \\ 3 3 \\ \hline x = -\frac{2}{3} \end{array}$$

$$\begin{array}{r} x - 1 = 0 \\ +1 +1 \\ \hline x = 1 \end{array}$$

State the degree and list the zeros of the polynomial function. Then state the multiplicity of each zero and whether the graph **crosses** the x-axis at the corresponding x-intercept.

$$f(x) = 7x(x-3)^2(x+5)^4$$

degree = 7

zeros:  $x=0 \rightarrow$  multiplicity 1

$x=3 \rightarrow$  multiplicity 2

$x=-5 \rightarrow$  multiplicity 4

$x=0$  because

the power on  
 $x$  is odd

Using Algebra, find a cubic function with the given zeros.

2, -5, 3

$$(x-2)(x+5)(x-3)$$

$$(x^2 + 3x - 10)(x-3)$$

$$\begin{array}{r} x^3 + 3x^2 - 10x \\ - 3x^2 - 9x + 30 \\ \hline x^3 - 19x + 30 \end{array}$$