

## Creating Polynomial Equations Given a Graph

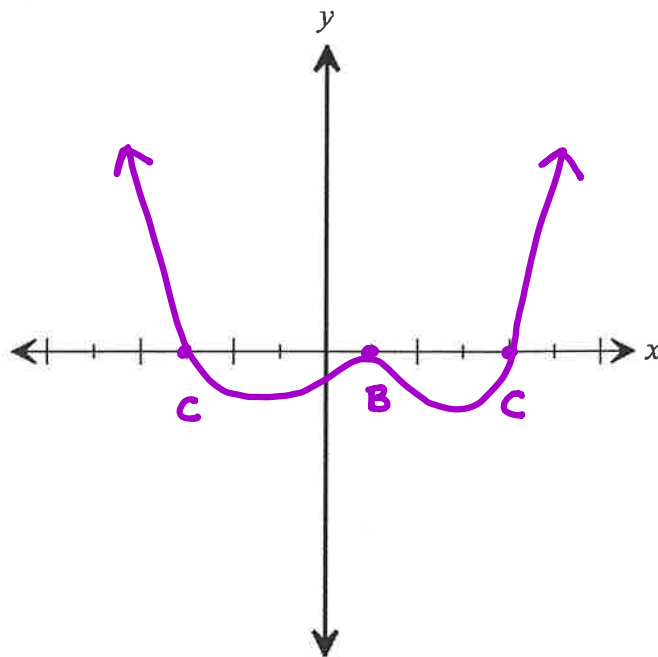
## Do Now:

Sketch the graph of the function  $f(x) = (x-4)(x+3)(x-1)^2$

$$\begin{array}{ccc} X=4 & X=-3 & X=1 \\ M=1 & M=1 & M=2 \\ C & C & B \end{array}$$

Degree: 4/  
positive

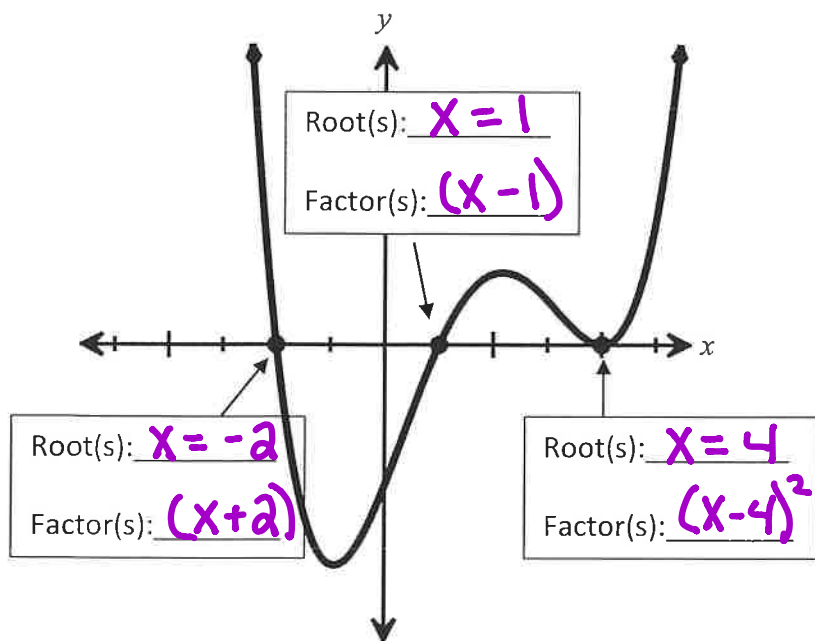
↑ ↑



Which of the following is true about the graph of  $f(x)$ ?

- (1) as  $x \rightarrow \infty$ ,  $f(x) \rightarrow \infty$       (3) as  $x \rightarrow \infty$ ,  $f(x) \rightarrow \infty$   
as  $x \rightarrow -\infty$ ,  $f(x) \rightarrow \infty$       as  $x \rightarrow -\infty$ ,  $f(x) \rightarrow -\infty$
- (2) as  $x \rightarrow \infty$ ,  $f(x) \rightarrow -\infty$       (4) as  $x \rightarrow \infty$ ,  $f(x) \rightarrow -\infty$   
as  $x \rightarrow -\infty$ ,  $f(x) \rightarrow -\infty$       as  $x \rightarrow -\infty$ ,  $f(x) \rightarrow \infty$

**Example #1:** Consider the following graph of a polynomial function  $f(x)$ .



- a) What could be a possible equation for  $f(x)$ ?

$$f(x) = (x+2)(x-1)(x-4)^2$$

$\uparrow$   
 $a=1$

- b) Determine the equation of the function if it passes through the point (3, 30).

$$\begin{aligned} 30 &= a(3+2)(3-1)(3-4)^2 \\ 30 &= a(5)(2)(-1)^2 \\ 30 &= a(10) \\ 3 &= a \end{aligned}$$

$$f(x) = 3(x+2)(x-1)(x-4)^2$$

- c) Determine the equation of the function if it passes through the point (-4, 160)

$$160 = a(-4+2)(-4-1)(-4-4)^2$$

$$160 = a(-2)(-5)(-8)^2$$

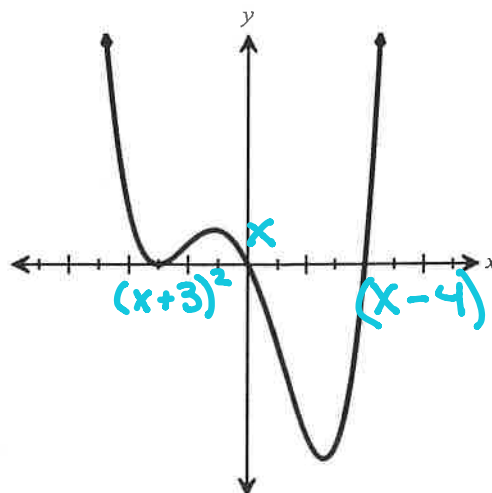
$$\frac{160}{640} = \frac{a \cdot 640}{640}$$

$$a = .25 = \frac{1}{4}$$

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

**Example #2:** Given the following polynomial graph, answer the following:

- The degree of the polynomial is **EVEN** or **ODD**
- The leading coefficient is **POSITIVE** or **NEGATIVE**
- There is an absolute **MAXIMUM**, **MINIMUM**, or **NEITHER**
- Write a possible equation:  $f(x) = \underline{x(x+3)^2(x-4)}$
- Write an equation if the function passes through the point (2, -10)



$$-10 = a \cdot (2)(2+3)^2(2-4)$$

$$-10 = a \cdot (2)(5)^2(-2)$$

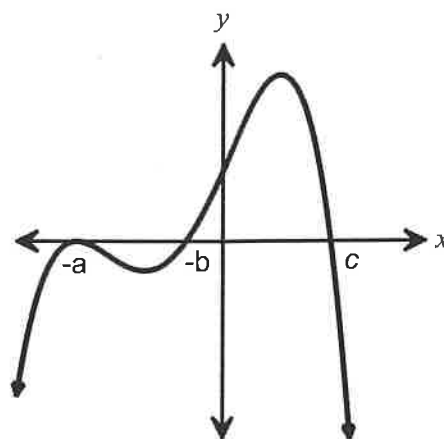
$$-10 = a \cdot (-100)$$

$$a = .1 = \frac{1}{10}$$

$$f(x) = \frac{1}{10} x (x+3)^2 (x-4)$$

**Example #3:** Given the following polynomial graph, answer the following:

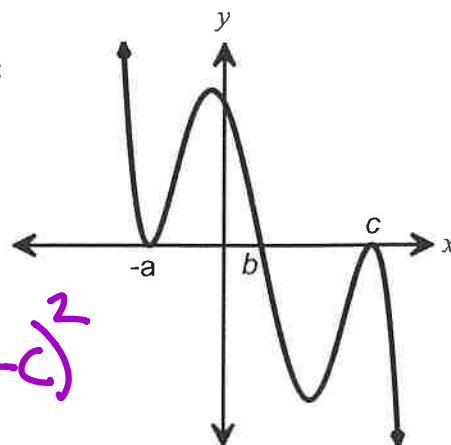
- The degree of the polynomial is **EVEN** or **ODD**
- The leading coefficient is **POSITIVE** or **NEGATIVE**
- There is an absolute **MAXIMUM**, **MINIMUM**, or **NEITHER**
- Write a possible equation:  $f(x) = \underline{-(x+a)^2(x+b)(x-c)}$



don't forget  
the negative

**Example #4:** Given the following polynomial graph, answer the following:

- The degree of the polynomial is **EVEN** or **ODD**
- The leading coefficient is **POSITIVE** or **NEGATIVE**
- There is an absolute **MAXIMUM**, **MINIMUM**, or **NEITHER**
- Write a possible equation:  $f(x) = \underline{-(x+a)^2(x-b)(x-c)^2}$



Directions: Match each polynomial function with its potential graph.

✓  $f(x) = -(x+a)^2(x+b)(x-c)$

✓  $g(x) = -(x-a)^2(x+b)$

✓  $h(x) = (x-a)^2(x+a)^2$

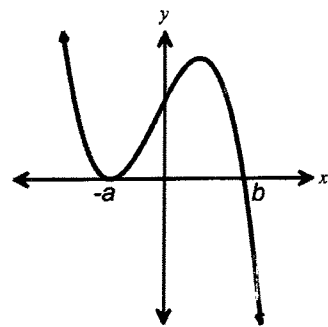
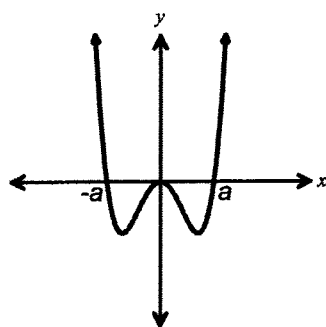
✓  $k(x) = -(x+a)^2(x-b)$

✓  $m(x) = x^2(x-a)(x+a)$

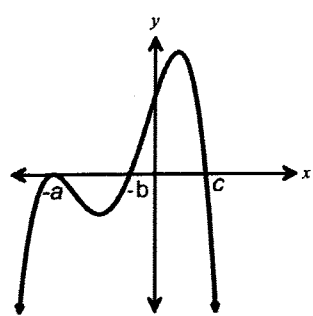
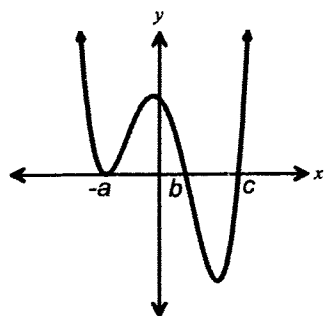
✓  $n(x) = (x-a)(x-b)^2(x+c)^2$

✓  $p(x) = (x+a)^2(x-b)(x-c)$

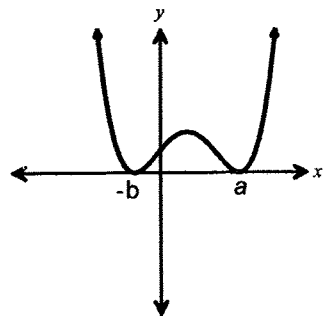
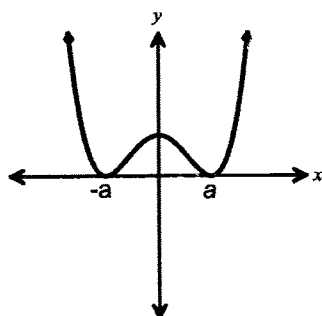
✓  $q(x) = (x-a)^2(x+b)^2$



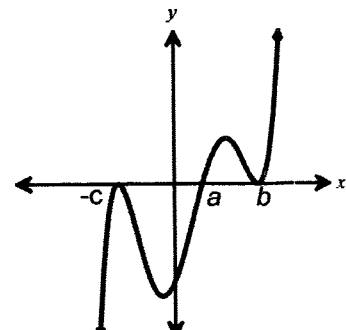
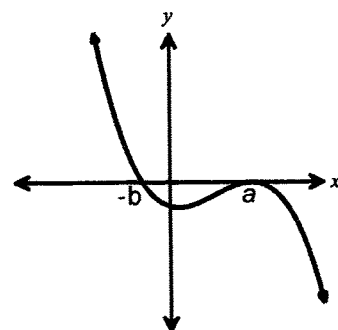
1)  $m(x) = x^2(x-a)(x+a)$  2)  $k(x) = -(x+a)^2(x-b)$



3)  $p(x) = (x+a)^2(x-b)(x-c)$  4)  $f(x) = -(x+a)^2(x+b)(x-c)$



5)  $h(x) = (x-a)^2(x+a)^2$  6)  $q(x) = (x-a)^2(x+b)^2$



7)  $g(x) = -(x-a)^2(x+b)$  8)  $n(x) = (x-a)(x-b)^2(x+c)^2$