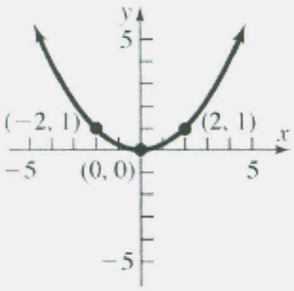
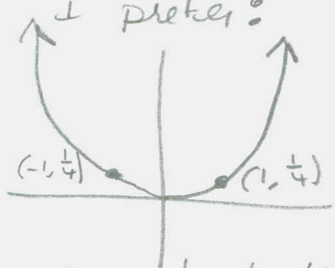
19. $f(x)=\frac{1}{4}x^2$

Using the graph of $y=x^2$, compress vertically by a factor of $\frac{1}{4}$.



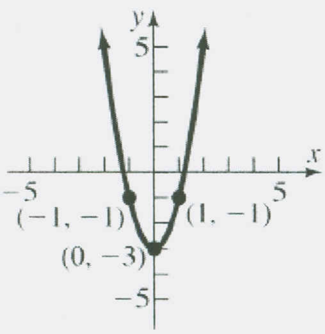
I prefer:



Always track the "standard points."

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

Using the graph of $y=x^2$, stretch vertically by a factor of 2, then shift down 3 units.

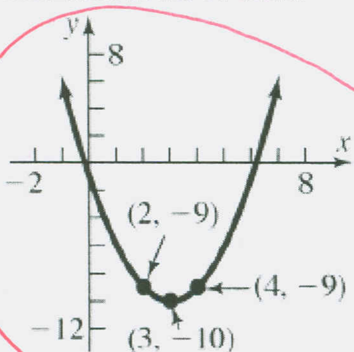


28. $f(x)=x^2-6x-1$

$=(x^2-6x+9)-1-9$

$=(x-3)^2-10$ → 1pt

Using the graph of $y=x^2$, shift right 3 units, then shift down 10 units.



→ 1pt

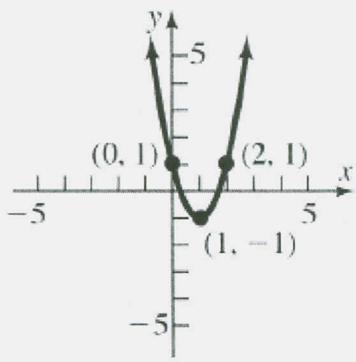
29. $f(x)=2x^2-4x+1$

$=2\left(x^2-2x\right)+1$

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

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

Using the graph of $y=x^2$, shift right 1 unit, stretch vertically by a factor of 2, then shift down 1 unit.



32. $f(x)=-2x^2+6x+2$

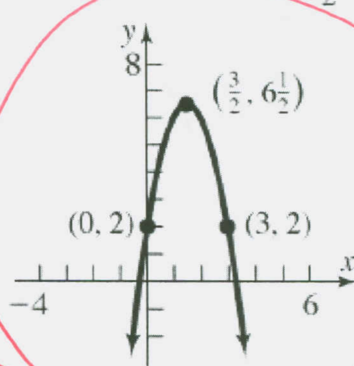
$=-2\left(x^2-3x\right)+2$

$=-2\left(x^2-3x+\frac{9}{4}\right)+2+\frac{9}{2}$

$=-2\left(x-\frac{3}{2}\right)^2+\frac{13}{2}$

→ 2pts

Using the graph of $y=x^2$, shift right $\frac{3}{2}$ units, reflect about the x-axis, stretch vertically by a factor of 2, then shift up $\frac{13}{2}$ units.



→ 1pt

5

54. Consider the form $y = a(x-h)^2 + k$. From the graph we know that the vertex is $(2,1)$ so we have $h = 2$ and $k = 1$. The graph also passes through the point $(x, y) = (0,5)$. Substituting these values for *x*, *y*, *h*, and *k*, we can solve for *a*: → 1pt

$5 = a(0-2)^2 + 1$ ← Write $a(x-2)^2 + 1$ before this THEN plug in (0,5)

$5 = a(-2)^2 + 1$

$5 = 4a + 1$

$4 = 4a$

$1 = a$ → 1pt

The quadratic function is

$f(x) = (x-2)^2 + 1 = x^2 - 4x + 5$. → This is fine 1pts

61. For $f(x) = 2x^2 + 12x - 3$, $a = 2$, $b = 12$, $c = -3$. Since $a = 2 > 0$, the graph opens up, so the vertex is a minimum point. The minimum occurs at $x = \frac{-b}{2a} = \frac{-12}{2(2)} = \frac{-12}{4} = -3$. The minimum value is

$f(-3) = 2(-3)^2 + 12(-3) - 3 = 18 - 36 - 3 = -21$.

67. Use the form $f(x) = a(x-h)^2 + k$.

The vertex is $(0, 2)$, so $h = 0$ and $k = 2$.

$f(x) = a(x-0)^2 + 2 = ax^2 + 2$.

Since the graph passes through $(1, 8)$, $f(1) = 8$.

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

$8 = a(1)^2 + 2$

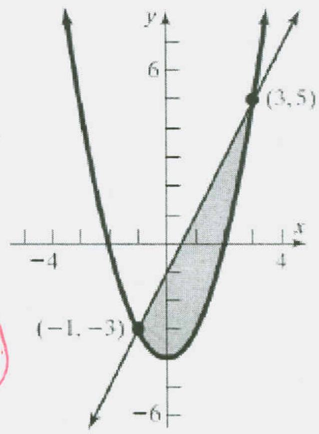
$8 = a + 2$

$6 = a$

$f(x) = 6x^2 + 2$.

$a = 6, b = 0, c = 2$

69. a and d.



b. $f(x) = g(x)$

$2x - 1 = x^2 - 4$

$0 = x^2 - 2x - 3$

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

$x + 1 = 0$ or $x - 3 = 0$

$x = -1$ $\quad$ $x = 3$

c. $f(-1) = 2(-1) - 1 = -2 - 1 = -3$

$g(-1) = (-1)^2 - 4 = 1 - 4 = -3$

$f(3) = 2(3) - 1 = 6 - 1 = 5$

$g(3) = 3^2 - 4 = 9 - 4 = 5$

Thus, the graphs of *f* and *g* intersect at the points $(-1, -3)$ and $(3, 5)$.

Add 2 points for the context that's MISSING from these solutions

3pts

75. a. For $a = 1$:

$$f(x) = a(x - r_1)(x - r_2)$$
$$= 1(x - (-3))(x - 1)$$
$$= (x + 3)(x - 1) = x^2 + 2x - 3$$

For $a = 2$:

$$f(x) = 2(x - (-3))(x - 1)$$
$$= 2(x + 3)(x - 1)$$
$$= 2(x^2 + 2x - 3) = 2x^2 + 4x - 6$$

For $a = -2$:

$$f(x) = -2(x - (-3))(x - 1)$$
$$= -2(x + 3)(x - 1)$$
$$= -2(x^2 + 2x - 3) = -2x^2 - 4x + 6$$

For $a = 5$:

$$f(x) = 5(x - (-3))(x - 1)$$
$$= 5(x + 3)(x - 1)$$
$$= 5(x^2 + 2x - 3) = 5x^2 + 10x - 15$$

b. The x-intercepts are not affected by the value of a. The y-intercept is multiplied by the value of a.

c. The axis of symmetry is unaffected by the value of a. For this problem, the axis of symmetry is $x = -1$ for all values of a.

d. The x-coordinate of the vertex is not affected by the value of a. The y-coordinate of the vertex is multiplied by the value of a.

e. The x-coordinate of the vertex is the midpoint of the x-intercepts.