CH.3 REVIEW

Please complete pgs. 198 - 200

Questions 1bc, 4ab, 5, 9, 10b, & 14

Solutions

1. {b&c} Use transformations to explain how the graph of each quadratic function compares to the graph of $f(x)=x^2$. Identify the vertex, the axis of symmetry, the direction of opening, the maximum or minimum value, and the domain and range without graphing.

b) $f(x) = -2x^2 + 19$

The graph of $f(x)=-2x^2+19$ will have a shape that is narrower than the graph of $f(x)=x^2$ and be reflected in the x-axis. Since $p=0$ and $q=19$, this represents a vertical translation of 19 units up relative to the graph of $f(x)=x^2$.

Vertex: $(0, 19)$
Axis of Symmetry: $x=0$
Direction of Opening: Downward
Maximum Value: $y=19$ or $(0, 19)$
Domain: $\{x \mid x \in R\}$
Range: $\{y \mid y \leq 19, y \in R\}$

c) $f(x)= \frac{1}{5}(x-10)^2+100$

The graph of $f(x)=\frac{1}{5}(x-10)^2+100$ will have a shape that is wider than the graph of $f(x)=x^2$. Since $p=10$ and $q=100$, this represents a horizontal translation of 10 units to the right and a vertical translation of 100 units up relative to the graph of $f(x)=x^2$.

Vertex: $(10, 100)$
Axis of Symmetry: $x=10$
Direction of Opening: Upward
Minimum Value: $y=100$ or $(10, 100)$
Domain: $\{x \mid x \in R\}$
Range: $\{y \mid y \geq 100, y \in R\}$

Solutions

4. Determine a quadratic function with each set of characteristics.

{a&b} a) vertex at (0,0), passing through the point (20,-150)

$y = a(x-p)^2 + q$
$y = a(x-0)^2 + 0$
$y = a(x)^2$

$-150 = a(20)^2$
$-150 = a(400)$
$\frac{-150}{400} = \frac{400a}{400}$
$-\frac{3}{8} = a$

$\boxed{y = -\frac{3}{8}x^2}$

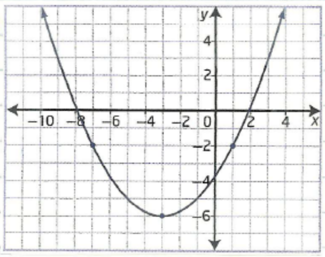
b) vertex at (8,0), passing through the point (2,54).

$y = a(x-p)^2 + q$
$y = a(x-8)^2 + 0$
$y = a(x-8)^2$

$54 = a(2-8)^2$
$54 = a(-6)^2$
$54 = a(36)$
$\frac{54}{36} = \frac{36a}{36}$
$\frac{3}{2} = a$

$\boxed{y = \frac{3}{2}(x-8)^2}$

5. Write a quadratic function in vertex form for each graph.

a) 

Vertex: (-3,-6)
Point: (1,-2)

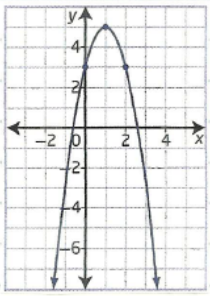
$y = a(x-p)^2 + q$
$y = a(x+3)^2 - 6$

$-2 = a(1+3)^2 - 6$
$-2 = a(4)^2 - 6$
$-2 + 6 = a(16)$
$\frac{4}{16} = \frac{16a}{16}$
$\frac{1}{4} = a$

$\boxed{y = \frac{1}{4}(x+3)^2 - 6}$

Solutions

b)



Vertex: (1,5)
Point: (0,3)

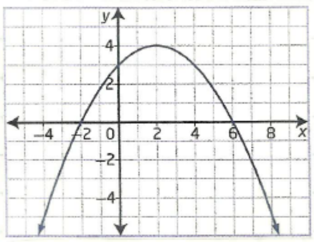
$y = a(x-p)^2 + q$
$y = a(x-1)^2 + 5$

$3 = a(0-1)^2 + 5$
$3 = a(-1)^2 + 5$
$3 - 5 = a(1)$
$\frac{-2}{1} = \frac{\cancel{1}a}{\cancel{1}}$
$-2 = a$

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

9. For each graph, identify the vertex, axis of symmetry, maximum or minimum value, direction of opening, domain and range, and any intercepts.

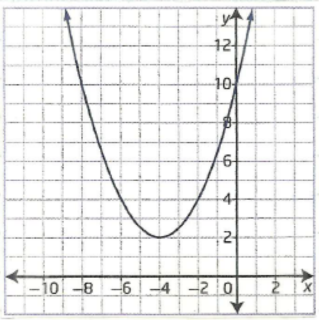
a)



Vertex: (2,4)
Axis of Symmetry: $x=2$
Maximum Value: $y=4$ or (2,4)
Direction of Opening: Downward
Domain: $\{x \mid x \in R\}$
Range: $\{y \mid y \leq 4, y \in R\}$

x-intercepts: $x=-2$ and $x=6$
y-intercept: $y=3$

b)



Vertex: (-4,2)
Axis of Symmetry: $x=-4$
Minimum Value: $y=2$ or (-4,2)
Direction of Opening: Upward
Domain: $\{x \mid x \in R\}$
Range: $\{y \mid y \geq 2, y \in R\}$

x-intercepts: NONE
y-intercept: $y=10$.

Solutions

10. Show why each function fits the definition of a quadratic function.

b) $y = (2x+7)(10-3x)$
$y = 20x - 6x^2 + 70 - 21x$
$y = -6x^2 + 20x - 21x + 70$
$y = -6x^2 - 1x + 70$

This is a quadratic function since the highest exponent is 2.

14. Write each function in vertex form.

a) $y = x^2 - 24x + 10$
$y = (x^2 - 24x) + 10$
$y = (x^2 - 24x + 144 - 144) + 10$
$y = (x^2 - 24x + 144) - 144 + 10$
$y = (x-12)^2 - 134$

b) $y = 5x^2 + 40x - 27$
$y = 5(x^2 + 8x) - 27$
$y = 5(x^2 + 8x + 16 - 16) - 27$
$y = 5[(x^2 + 8x + 16) - 16] - 27$
$y = 5[(x+4)^2 - 16] - 27$
$y = 5(x+4)^2 - 80 - 27$
$y = 5(x+4)^2 - 107$

Solutions

c) $y = -2x^2 + 8x$
$y = -2(x^2 - 4x)$
$y = -2(x^2 - 4x + 4 - 4)$
$y = -2[(x^2 - 4x + 4) - 4]$
$y = -2[(x-2)^2 - 4]$
$y = -2(x-2)^2 + 8$

d) $y = -30x^2 - 60x + 105$
$y = -30(x^2 + 2x) + 105$
$y = -30(x^2 + 2x + 1 - 1) + 105$
$y = -30[(x^2 + 2x + 1) - 1] + 105$
$y = -30[(x+1)^2 - 1] + 105$
$y = -30(x+1)^2 + 30 + 105$
$y = -30(x+1)^2 + 135$