



Unit 9 Test Review

Name Key Per _____

Solve each of the following quadratic equations.

<p>1. $x^2 - x - 12 = 0$</p> $(x-4)(x+3) = 0$ $x = 4 \quad x = -3$	<p>2. $x^2 - 40 = -3x$</p> $x^2 + 3x - 40 = 0$ $(x+8)(x-5) = 0$ $x = -8 \quad x = 5$
<p>3. $3(x-9)^2 = 81$</p> $(x-9)^2 = 27$ $\sqrt{(x-9)^2} = \pm\sqrt{27}$ $x-9 = \pm 3\sqrt{3}$ $x = 9 \pm 3\sqrt{3}$ $x = 9 + 3\sqrt{3}, 9 - 3\sqrt{3}$	<p>4. $x^2 - 25 = 0$</p> $(x+5)(x-5) = 0$ $x = -5, 5$
<p>5. $5x^2 - 35x + 60 = 0$</p> $5(x^2 - 7x + 12) = 0$ $x^2 - 7x + 12 = 0$ $(x-3)(x-4) = 0$ $x = 3 \quad x = 4$	<p>6. $2x^2 + 4x - 1 = 7x^2 - 7x + 1$</p> $4x - 1 = 5x^2 - 7x + 1$ $0 = 5x^2 - 11x + 2$ $0 = 5x^2 - x - 10x + 2$ $0 = x(5x-1) - 2(5x-1)$ $0 = (x-2)(5x-1)$ $x = 2 \quad x = \frac{1}{5}$ <div style="text-align: right;">  </div>

7. Factor completely.

<p>a. $x^2 - 11x + 30$</p> $(x-6)(x-5)$	<p>b. $h^2 + h - 90$</p> $(h+10)(h-9)$
<p>c. $3n^2 - 27$</p> $3(n^2 - 9)$ $3(n+3)(n-3)$	<p>d. $15m^2 - 27m - 6$</p> $3(5m^2 - 9m - 2)$ $3(5m^2 - 10m + m - 2)$ $3[5m(m-2) + 1(m-2)]$ <div style="text-align: right;">  </div>

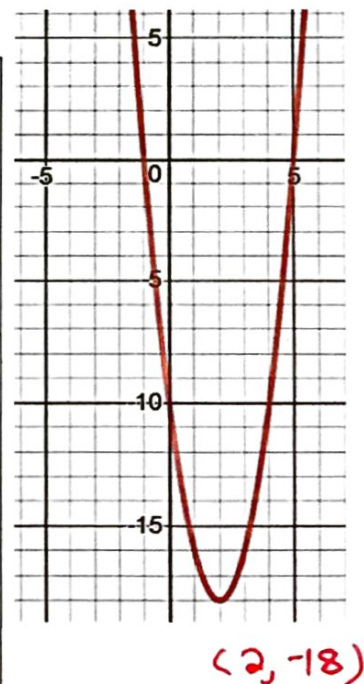
$$3(5m+1)(m-2)$$

8. Use the function $m(x) = -(x+5)(x-3)$ to answer the following.

<p>a. What is the vertex?</p> <p>x-intercepts at $-5, 3$</p> $\frac{-5+3}{2} = -1$ $m(-1) = -(-1+5)(-1-3)$ $= -(4)(-4) \quad (-1, 16)$ $= 16$	<p>b. Does $m(x)$ have a maximum or minimum? Explain how you know.</p> <p>Maximum because the graph opens down.</p>
<p>c. What is the y-intercept?</p> $m(x) = -(x+5)(x-3)$ $= -(x^2 + 2x - 15)$ $= -x^2 + 2x + 15$ <p>y-inter: 15</p>	<p>d. If the zeros are at $x=a$ and $x=b$, where $a < b$, then what are the values of a and b?</p> <p>a= <u>-5</u></p> <p>b= <u>3</u></p>
<p>e. What is $m(7)$?</p> $m(7) = -(7+5)(7-3)$ $= -(12)(4)$ $= -48$	<p>f. What is the axis of symmetry?</p> <p>$x = -1$</p>

9. Use the graph to the right to answer the following questions.

<p>a. What is the minimum value?</p> <p>-18</p>	<p>b. What are the roots?</p> <p>-1 and 5</p>
<p>c. What is the equation of the parabola in standard form?</p> $y = a(x-2)^2 - 18$ <p>use $(0, -10)$</p> $-10 = a(0-2)^2 - 18$ $-10 = a(-2)^2 - 18$ $-10 = 4a - 18$ $8 = 4a$ $2 = a$ $y = 2(x-2)^2 - 18$	<p>d. Is the point $(-3, 32)$ on this parabola? Show your work.</p> $32 \stackrel{?}{=} 2(-3)^2 - 8(-3) - 10$ $32 = 18 + 24 - 10$ $32 = 42 - 10$ $32 = 32 \checkmark$ <p>Yes.</p>



$$y = 2(x^2 - 4x + 4) - 18$$

$$y = 2x^2 - 8x - 10$$

10. Use the function $n(x) = 3x^2 - 18x + 24$ for the following.

<p>a. Which of the following are equivalent to the function above? Circle all that apply.</p> <p>i. $n(x) = 3(x-2)(x-4)$</p> <p>ii. $n(x) = (3x-6)(x-4)$</p> <p>iii. $n(x) = (x-2)(x-4)$</p> <p>iv. $n(x) = 3(x^2 - 6x + 8)$</p> <p>v. $n(x) = (3x-6)(3x-12)$</p> <p>vi. $n(x) = (x-2)(3x-12)$</p>	<p>b. What are the x-intercepts?</p> $0 = 3(x^2 - 6x + 8)$ $0 = x^2 - 6x + 8$ $0 = (x-4)(x-2)$ $x = 4 \quad x = 2$
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11. The area of a rectangular garden can be modeled by the expression $4x^2 - 10x - 24$. Rewrite the area in terms of its linear factors.

$$2(2x^2 - 5x - 12)$$

$$2(2x^2 - 8x + 3x - 12)$$

$$2[2x(x-4) + 3(x-4)] \rightarrow 2(2x+3)(x-4)$$

~~$\begin{matrix} -24 \\ -8 & +3 \\ -5 \end{matrix}$~~

12. A rectangle has a base that is one less than three times its height. The area of the rectangle is 10 square meters. What are the dimensions of the rectangle? Solve using algebra.

$h = \text{height}$ $A = b \times h$ $0 = (3h+5)(h-2)$

$b = 3h-1$ $A = (3h-1)(h)$ $3h+5=0$ $h-2=0$

$10 = 3h^2 - h$ $0 = 3h^2 - h - 10$ $h = \frac{-5}{3}$ $\boxed{h=2}$

$0 = 3h^2 - h - 10$

$0 = 3h^2 - 6h + 5h - 10$

$0 = 3h(h-2) + 5(h-2)$

$\boxed{\text{base} = 5}$

13. Two consecutive even integers have a product of 288. What are the integers? Solve using algebra.

$x = 1^{\text{st}} \text{ number}$ $(x+18)(x-16) = 0$

$x+2 = 2^{\text{nd}} \text{ number}$

$x(x+2) = 288$

$x^2 + 2x = 288$

$x^2 + 2x - 288 = 0$

$x = -18$ $x = 16$

\downarrow \downarrow
 $\boxed{-18, -16}$ $\boxed{16, 18}$

14. What are two other vocabulary words used to describe x-intercepts? roots, zeros, solutions

Graph each of the following quadratic functions (including the dashed axis of symmetry). Identify all key features of the graph.

15. $f(x) = -x^2 - 6x - 5$

x-intercept(s) -5, -1

y-intercept -5

vertex (-3, 4)

axis of symmetry $x = -3$

$0 = -(x^2 + 6x + 5)$

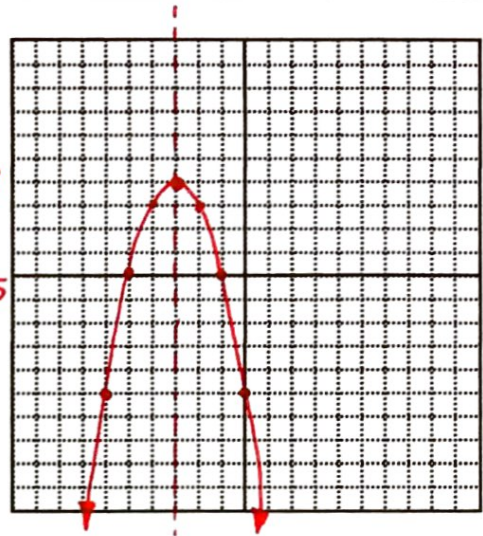
$0 = x^2 + 6x + 5$

$0 = (x + 5)(x + 1)$

$x = -5, -1$

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

$f(-3) = -(-3)^2 - 6(-3) - 5$
 $= -9 + 18 - 5$
 $= 4$



16. $g(x) = 2(x-1)(x-3)$

root(s) 1, 3

y-intercept 6

vertex (2, -2)

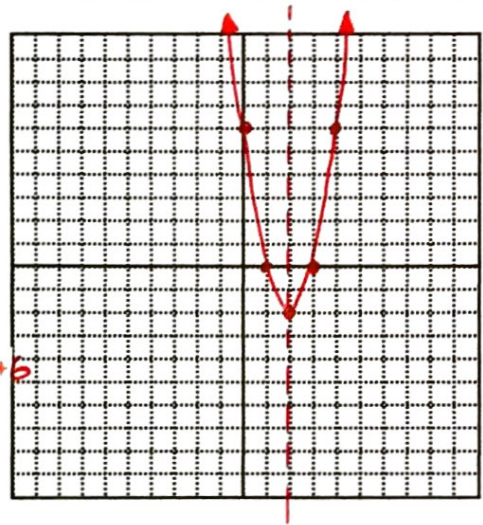
axis of symmetry $x = 2$

$g(x) = 2(x^2 - 4x + 3)$

$g(x) = 2x^2 - 8x + 6$

$-\frac{b}{2a} = \frac{-(-8)}{2(2)} = \frac{8}{4} = 2$

$g(2) = 2(2)^2 - 8(2) + 6$
 $= 8 - 16 + 6$
 $= -2$



17. $h(x) = 3x^2 + 12x + 9$

zero(s) -1, -3

y-intercept 9

vertex (-2, -3)

axis of symmetry $x = -2$

$h(x) = 3(x^2 + 4x + 3)$

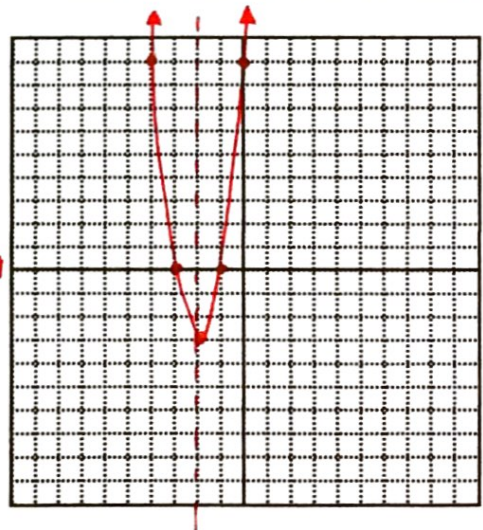
$0 = 3(x + 3)(x + 1)$

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

$x = -1, -3$

$-\frac{b}{2a} = \frac{-12}{2(3)} = \frac{-12}{6} = -2$

$h(-2) = 3(-2)^2 + 12(-2) + 9$
 $= 3(4) - 24 + 9$
 $= 12 - 24 + 9$
 $= -12 + 9$
 $= -3$



18. A cannonball is shot from an initial height of 112 feet. The following equation models the height of the cannonball, h , with respect to time, t , in seconds.

$$h(t) = -16t^2 + 96t + 112$$

$-16(3)^2 + 96(3) + 112$
 $-144 + 288 + 112$

a. What is the maximum height reached by the cannonball?

256 feet

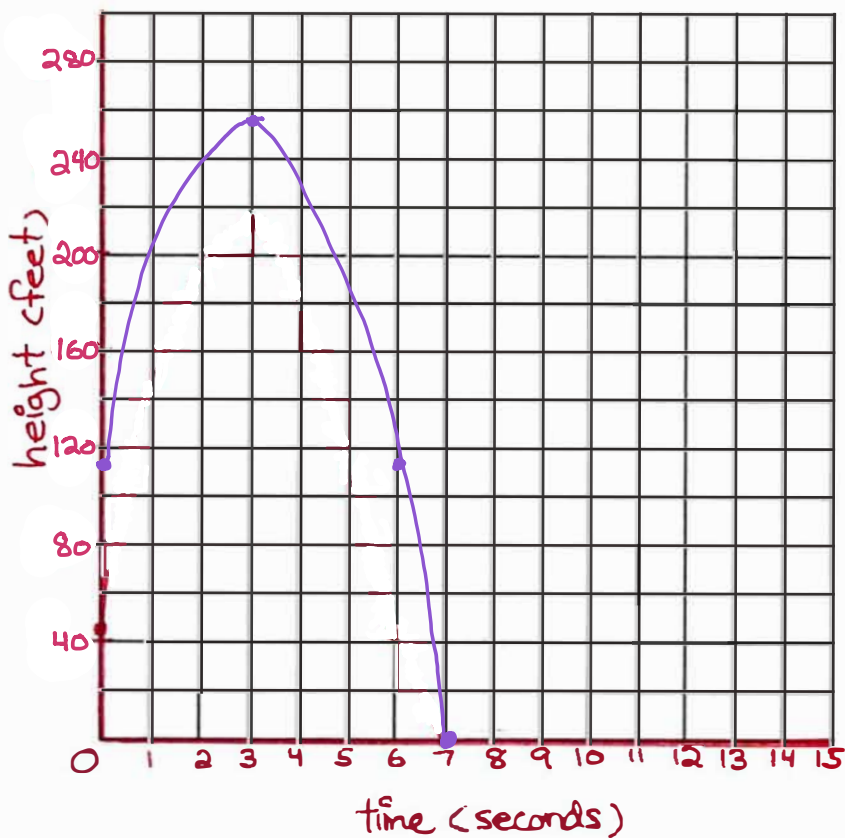
b. When does the cannonball reach its maximum height?

3 seconds.

c. How long is it until the cannonball hits the ground?

7 seconds

d. Graph the function. Use appropriate scales and labels.



$$\frac{-b}{2a} = \frac{-96}{2(-16)} = \frac{-96}{-32} = 3$$

$$h(3) = -16(3)^2 + 96(3) + 112$$

$$h(t) = -16(t^2 - 6t - 7)$$

$$0 = t^2 - 6t - 7$$

$$0 = (t - 7)(t + 1)$$

$$t = 7, t = -1$$