

Key

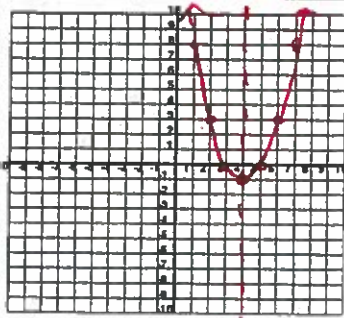
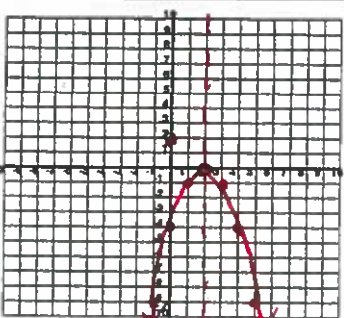
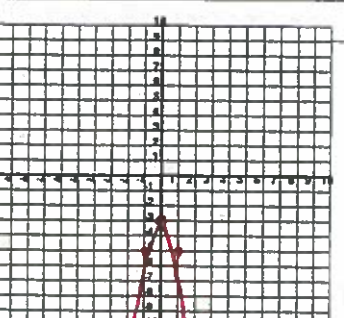
Unit 8 Test Study Guide

Quadratic Equations

Topic #1: Axis of Symmetry & Vertex

<p>1. $y = -x^2 + 10x - 28$</p> $\frac{-10}{2(-1)} = \frac{-10}{-2} = 5$ $-25 + 50 - 28$ <p>Axis of Symmetry <u>$x = 5$</u></p> <p>Vertex <u>$(5, -3)$</u></p>	<p>2. $y = 2x^2 + 4x$</p> $\frac{-4}{2(2)} = \frac{-4}{4} = -1$ $2 + (-4)$ <p>Axis of Symmetry <u>$x = -1$</u></p> <p>Vertex <u>$(-1, -2)$</u></p>	<p>3. $y = x^2 - 9$</p> <p>Axis of Symmetry <u>$x = 0$</u></p> <p>Vertex <u>$(0, -9)$</u></p>
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Topic #2: Graphing Quadratic Equations

<p>4. $y = x^2 - 8x + 15$</p> $\frac{8}{2} = 4$ $16 - 32 + 15$ $1 - 8 + 15$ $4 - 16 + 15$ $9 - 24 + 15$ <table border="1"> <thead> <tr><th>x</th><th>y</th></tr> </thead> <tbody> <tr><td>1</td><td>8</td></tr> <tr><td>2</td><td>3</td></tr> <tr><td>3</td><td>0</td></tr> <tr><td>4</td><td>-1</td></tr> <tr><td>5</td><td>0</td></tr> <tr><td>6</td><td>3</td></tr> <tr><td>7</td><td>8</td></tr> </tbody> </table>  <p>Axis of Symmetry: <u>$x = 4$</u></p> <p>Vertex: <u>$(4, -1)$</u></p> <p>Domain: <u>\mathbb{R}</u></p> <p>Range: <u>$y \geq -1$</u></p> <p>Zeros: <u>$x = \{3, 5\}$</u></p>	x	y	1	8	2	3	3	0	4	-1	5	0	6	3	7	8
x	y															
1	8															
2	3															
3	0															
4	-1															
5	0															
6	3															
7	8															
<p>5. $y = -x^2 + 4x - 4$</p> $\frac{-4}{-2} = 2$ $-4 + 8 - 4$ $-1 + 4 - 4$ $-25 + 20 - 4$ <table border="1"> <thead> <tr><th>x</th><th>y</th></tr> </thead> <tbody> <tr><td>-1</td><td>-9</td></tr> <tr><td>0</td><td>-4</td></tr> <tr><td>1</td><td>-1</td></tr> <tr><td>2</td><td>0</td></tr> <tr><td>3</td><td>-1</td></tr> <tr><td>4</td><td>-4</td></tr> <tr><td>5</td><td>-9</td></tr> </tbody> </table>  <p>Axis of Symmetry: <u>$x = 2$</u></p> <p>Vertex: <u>$(2, 0)$</u></p> <p>Domain: <u>\mathbb{R}</u></p> <p>Range: <u>$y \leq 0$</u></p> <p>Zeros: <u>$x = \{2\}$</u></p>	x	y	-1	-9	0	-4	1	-1	2	0	3	-1	4	-4	5	-9
x	y															
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<p>6. $y = -2x^2 - 3$</p> $-2 - 3$ $-8 - 3$ $-18 - 3$ <table border="1"> <thead> <tr><th>x</th><th>y</th></tr> </thead> <tbody> <tr><td>-3</td><td>-21</td></tr> <tr><td>-2</td><td>-11</td></tr> <tr><td>-1</td><td>-5</td></tr> <tr><td>0</td><td>-3</td></tr> <tr><td>1</td><td>-5</td></tr> <tr><td>2</td><td>-11</td></tr> <tr><td>3</td><td>-21</td></tr> </tbody> </table>  <p>Axis of Symmetry: <u>$x = 0$</u></p> <p>Vertex: <u>$(0, -3)$</u></p> <p>Domain: <u>\mathbb{R}</u></p> <p>Range: <u>$y \leq -3$</u></p> <p>Zeros: <u>None</u></p>	x	y	-3	-21	-2	-11	-1	-5	0	-3	1	-5	2	-11	3	-21
x	y															
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Topic #3: Solving Quadratic Equations (By Factoring/Square Roots)

<p>7. $x^2 - 7x = 44$</p> $x^2 - 7x - 44 = 0$ $(x - 11)(x + 4) = 0$ $x = \{-4, 11\}$	<p>8. $2x^2 + 3x - 72 = x^2 + 2x$</p> $\begin{array}{r} -x^2 - 2x \\ \hline x^2 + 3x - 72 = 0 \\ (x + 9)(x - 8) = 0 \\ x = \{-9, 8\} \end{array}$
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<p>9. $3x^2 + 75 = 30x$</p> $\frac{3x^2 - 30x + 75}{3} = \frac{0}{3}$ $x^2 - 10x + 25 = 0$ $(x-5)(x-5) = 0$ $x = \{5\}$	<p>10. $11x^2 - x = x^2 + 2$</p> $\frac{-x^2 - 2 - x^2 - 2}{10x^2 - x - 2} = 0$ $10x^2 - x - 2 = 0$ $10x^2 - 5x + 4x - 2 = 0$ $5x(2x-1) + 2(2x-1) = 0$ $(2x-1)(5x+2) = 0$ $x = \left\{-\frac{2}{5}, \frac{1}{2}\right\}$
<p>11. $9x^2 - 36x = 0$</p> $9x(x-4) = 0$ $x = \{0, 4\}$	<p>12. $16x^2 = 10x$</p> $16x^2 - 10x = 0$ $2x(8x-5) = 0$ $x = \left\{0, \frac{5}{8}\right\}$
<p>13. $x^2 - 100 = 0$</p> $x^2 = 100$ $x = \{\pm 10\}$	<p>14. $25x^2 + 1 = 5$</p> $25x^2 = 4$ $x^2 = \frac{4}{25}$ $x = \left\{\pm \frac{2}{5}\right\}$
<p>15. $(x-1)(x-8) = 0$</p> $x = \{1, 8\}$	<p>16. $(x-7)(x+3) = 24$</p> $x^2 + 3x - 7x - 21 = 24$ $\frac{-24 \quad -24}{x^2 - 4x - 45 = 0}$ $(x-9)(x+5) = 0$ $x = \{-5, 9\}$

Topic #4: Solving Quadratic Equations (By the Quadratic Formula)

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$\frac{3}{18}$
 $\frac{x}{4}$
 $\frac{72}{72}$

<p>17. $x^2 - x = 18$ $a=1 \quad b=-1 \quad c=18$</p> $x^2 - x - 18 = 0$ $\frac{1 \pm \sqrt{1 - 4(1)(-18)}}{2}$ $\frac{1 \pm \sqrt{73}}{2}$ $x = \{-3.8, 4.7\}$	<p>18. $-x^2 + 4x = x - 20$ $a=-1 \quad b=3 \quad c=20$</p> $\frac{-x^2 + 3x + 20}{-x^2 + 3x + 20} = 0$ $\frac{-3 \pm \sqrt{9 - 4(-1)(20)}}{-2}$ $\frac{-3 \pm \sqrt{89}}{-2}$ $x = \{-1.6, 6.2\}$
<p>19. $8x^2 = 20x$ $a=8 \quad b=-20 \quad c=0$</p> $8x^2 - 20x = 0$ $\frac{20 \pm \sqrt{400 - 4(8)(0)}}{16}$ $\frac{20 \pm \sqrt{400}}{16}$ $\frac{20 \pm 20}{16}$ $x = \{0, 2.5\}$	<p>20. $4x^2 = 81$ $a=4 \quad b=0 \quad c=-81$</p> $4x^2 - 81 = 0$ $\frac{0 \pm \sqrt{0 - 4(4)(-81)}}{8}$ $\frac{\pm \sqrt{1296}}{8}$ $\pm \frac{36}{8}$ $x = \left\{\pm 4.5\right\}$

Topic #5: Area Problems

21. If the area of the rectangle below is 42 inches squared, find the value of x .



$$(x-3)(x+8) = 42$$

$$x^2 + 8x - 3x - 24 = 42$$

$$x^2 + 5x - 66 = 0$$

$$(x+11)(x-6) = 0$$

$x = 6$ in

22. The length of a rectangle is five feet less than its width. If the area of the rectangle is 84 square feet, find its dimensions.

$$l = w - 5$$

$$w(w-5) = 84$$

$$w^2 - 5w - 84 = 0$$

$$(w+7)(w-12) = 0$$

$w = 12$ ft

$l = 7$ ft

Topic #6: Projectile Motion

23. Natalie found a tennis ball outside a tennis court. She picked up the ball and threw it over the fence into the court. The path of the ball can be represented by $h = -16t^2 + 18t + 5$

a. Find the maximum height of the tennis ball.

$$t = \frac{-18}{-32} = 0.5625$$

$$h = -16(0.5625)^2 + 18(0.5625) + 5$$

$$h = -5.0625 + 10.125 + 5$$

$$h = 10.0625$$

b. How long will it take to reach the ground?

$$0 = -16t^2 + 18t + 5 \quad a = -16 \quad b = 18 \quad c = 5$$

$$t = \frac{-18 \pm \sqrt{324 - 4(-16)(5)}}{-32}$$

$$t = \frac{-18 \pm \sqrt{324 + 320}}{-32}$$

$$t = \frac{-18 \pm \sqrt{644}}{-32} = 1.4 \text{ seconds}$$

24. A circus acrobat is shot out of a cannon with an initial upward speed of 50 ft/s. The equation for the acrobat's pathway can be modeled by $h = -16t^2 + 50t + 4$.

a. Find the maximum height of the acrobat.

$$\frac{-50}{-32} = 1.5625$$

$$h = -16(1.5625)^2 + 50(1.5625) + 4$$

$$-39.0625 + 79.125 + 4$$

$$h = 43.0625 \text{ ft}$$

b. How long will it take to reach the ground?

$$0 = -16t^2 + 50t + 4$$

$$t = \frac{-50 \pm \sqrt{2500 - 4(-16)(4)}}{-32}$$

$$t = \frac{-50 \pm \sqrt{2756}}{-32}$$

$$t = 3.2 \text{ seconds}$$

Topic #7: Linear & Quadratic Modeling

25. Debbie recorded the time it took seven children of different ages to run a lap around the track. Using an equation to model the data, find the approximate time it would take for a 6-year old to run a lap.

AGE (years)	TIME (sec)
4	225
8	185
10	138
11	130
14	112
14	106
18	52

26. A pistol is accidentally discharged vertically in the air. The height, h , of the bullet at time t seconds is recorded in the table below. Using an equation to model the data, find the height of the pistol after 10 seconds.

t (sec)	h (ft)
0	3
1	187
2	339
3	459
4	547

