

Chapter 3 & 4 Final Review – Quadratic Functions and Quadratic Equations

Vertex form: $y = a(x - p)^2 + q$

Standard form: $y = ax^2 + bx + c$

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

Vertex Form

1. Graph each parabola and state its characteristics (coordinates of the vertex, equation of the axis of symmetry, y-intercept, x-intercepts, domain, range, maximum or minimum value).

a) $y = \frac{1}{4}x^2 - 4$

b) $y = -2(x - 1)^2 + 8$

2. Write an equation (in vertex form) for a parabola with a vertex at (-3, 5) passing through the point (2, -45).

3. Determine the vertex of each quadratic function by completing the square.

a) $y = x^2 - 4x - 12$

b) $y = -2x^2 - 8x - 5$

Standard Form

4. Graph each of the following.

a) $y = x^2 - 8x + 14$

b) $y = -2x^2 + 12x - 20$

Quadratic Problems

5. The sum of two numbers is 60. Find the numbers if their product is a maximum.

Solving Quadratic Equations

6. Solve $x^2 + 2x - 3 = 0$ by **graphing**.

7. Solve by **factoring**.

a) $x^2 + 3x - 28 = 0$

b) $4x^2 - 3x = 0$

c) $2x^2 = 27 - 15x$

d) $2x^2 + 5x = 3$

e) $16x^2 - 49 = 0$

f) $12x^2 - 27 = 0$

8. Solve by using the **square root principle**.

a) $5x^2 - 67 = 18$

b) $(x - 2)^2 = 81$

c) $25x^2 + 4 = 23$

9. Solve using the **quadratic formula**. State your answers as both **exact** and **approximate to two decimal places**.

a) $2x^2 + x - 4 = 0$

b) $10x^2 - 7x - 1 = 0$

10. Find the **discriminant** and the **nature of the roots** for the following quadratic equations.

a) $2x^2 - 4x = -2$

b) $-3x^2 = x + 9$

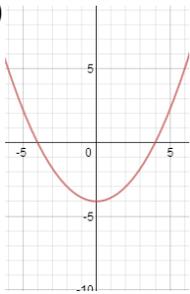
11. The area of a board is 270 cm^2 , and the length is 17 cm greater than the width. Build a quadratic equation and solve it to find the dimensions of the board.

12. A springboard diver's height, in metres, above the water, is given by the equation

$h(t) = -5t^2 + 8t + 4$, where h is the height in metres, and t is the time in seconds. When does the diver hit the water?

Solutions

1. a)



vertex: $(0, -4)$

axis of symm: $x = 0$

y-int: -4

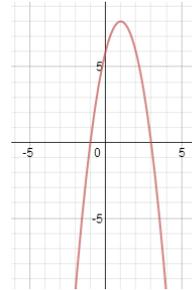
x-int: -4 and 4

domain: $\{x|x \in R\}$

range: $\{y|y \geq -4, y \in R\}$

max or min: -4 (min)

b)



vertex: $(1, 8)$

Axis of symm: $x = 1$

y-int: 6

x-int: -1 and 3

domain: $\{x|x \in R\}$

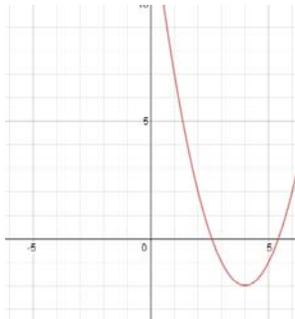
range: $\{y|y \leq 8, y \in R\}$

max or min: 8 (max)

2. $y = -2(x + 3)^2 + 5$

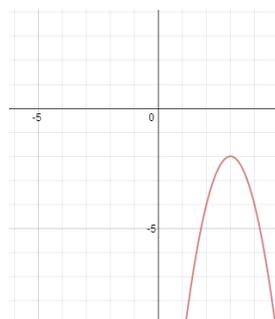
3. a) $(2, -16)$

4. a)



b) $(-2, 3)$

b)



5. 30 and 30

6. $x = 1$ and -3

7. a) $4, -7$

b) $0, \frac{3}{4}$

c) $-9, \frac{3}{2}$

d) $-3, \frac{1}{2}$

e) $\pm \frac{7}{4}$

f) $\pm \frac{3}{2}$

8. a) $\pm\sqrt{17}$

b) $-7, 11$

c) $\pm \frac{\sqrt{19}}{5}$

9. a) exact: $\frac{-1 \pm \sqrt{33}}{4}$; approx: -1.69 and 1.19

b) exact: $\frac{7 \pm \sqrt{89}}{20}$; approx: $-0.12, 0.82$

10. a) 0; one distinct real root

b) -107 ; no real roots

11. 27 cm by 10 cm

12. 2 seconds after diving