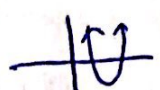
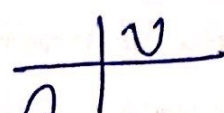
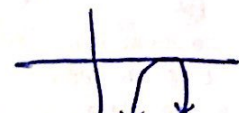


4.7 The Quadratic Formula

<p>THE QUADRATIC FORMULA</p> $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	1	$ax^2 + bx + c$ Write equation in standard form		
	2	identify + plug in a, b, c		
	3	Simplify		
<p>The Discriminant</p> $b^2 - 4ac$	Discriminant > 0 positive 2 real solutions 	Discriminant < 0 negative no real solutions 	Discriminant = 0 1 real solution 	

Find the value of the discriminant, then determine the number and type of solutions.

1. $2x^2 - 3x + 7 = 0$ $(-3)^2 - 4(2)(7)$ $9 - 56$ -47 no real solutions	2. $x^2 = 6x + 5$ $x^2 - 6x - 5 = 0$ $(-6)^2 - 4(1)(-5)$ $36 + 20$ 2 real solutions 56
3. $x^2 + 13x + 4 = 0$ $13^2 - 4(1)(4)$ $169 - 16$ 2 real solutions 153	4. $x^2 - 6x + 9 = 0$ $(-6)^2 - 4(1)(9) = 0$ $36 - 36$ 1 real solution 0

Solve each quadratic equations below using the quadratic formula.

5. $-x^2 + 2x = 1$ $-x^2 + 2x - 1 = 0$ $\frac{-2 \pm \sqrt{2^2 - 4(-1)(-1)}}{2(-1)}$ $\frac{-2 \pm \sqrt{4 - 4}}{-2}$ $\frac{-2 \pm \sqrt{0}}{-2} = \frac{-2}{-2} = 1$ <div style="border: 1px solid black; display: inline-block; padding: 2px;">X = 1</div>	6. $-2x^2 + 3x = 4x - 15$ $-2x^2 - x + 15 = 0$ $\frac{1 \pm \sqrt{(-1)^2 - 4(-2)(15)}}{2(-2)}$ $\frac{1 \pm \sqrt{1 + 120}}{-4}$ $\frac{1 \pm \sqrt{121}}{-4}$ $\frac{1 \pm 11}{-4}$ <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px;">X = -3</div> <div style="border: 1px solid black; padding: 2px;">5/2</div> </div>
---	---

7. $x^2 - 9 = 4x$

$x^2 - 4x - 9 = 0$

$$\frac{4 \pm \sqrt{(-4)^2 - 4(1)(-9)}}{2(1)}$$

$$\frac{4 \pm \sqrt{16 + 36}}{2}$$

$$\frac{4 \pm \sqrt{52}}{2} \quad (4.10)$$

$$\frac{4 \pm 2\sqrt{13}}{2} = \boxed{2 \pm \sqrt{13}}$$

8. $-x^2 + 10x = 8$

$-x^2 + 10x - 8 = 0$

$$\frac{-10 \pm \sqrt{10^2 - 4(-1)(-8)}}{2(-1)}$$

$$\frac{-10 \pm \sqrt{100 - 32}}{-2}$$

$$\frac{-10 \pm \sqrt{68}}{-2} \quad \sqrt{4 \cdot 17}$$

$$\frac{-10 \pm 2\sqrt{17}}{-2} = \boxed{5 \pm \sqrt{17}}$$

9. The equation $d = 120t - 5t^2$ models the height of a fireworks charge on the 4th of July, where t is in seconds, and d is in meters.

a. Calculate the height after 3 seconds.

plug in 3 for t

$$120(3) - 5(3)^2$$

$$360 - 45$$

315 meters

c. When does it reach its highest point?

t Vertex

$-5t^2 + 120t$

$$\frac{-b}{2a} = \frac{-120}{2(-5)} = 12 \text{ seconds}$$

b. When will the rocket reach 450 meters?

plug in 450 for d
solve quad form.

$$-5t^2 + 120t = 450$$

$$-5(t^2 - 24t + 90) = 0$$

$$\frac{24 \pm \sqrt{24^2 - 4(1)(90)}}{2(1)}$$

19.35 sec or 4.65 sec.

d. What is the highest distance reached?

vertex $\nearrow d$

$-5(12)^2 + 120(12)$

720 meters

10. The weekly revenue R for a company is $R = -3p^2 + 62p + 1080$, where p is the price of the company's product.

Use the discriminant to find whether there is a price for which the weekly revenue would be \$1800

$1800 = -3p^2 + 62p + 1080$

$0 = -3p^2 + 62p - 720$

$0 = -3p^2 + 62p - 720$

$$\frac{62 \pm \sqrt{62^2 - 4(-3)(-720)}}{2(-3)}$$

$$-4796 \quad \text{no real solutions}$$

11. Your club is selling boxes of cookie mix as a fundraiser. The total profit p depends on the amount x that your club charges for each box of cookie mix. The equation $P = -0.5x^2 + 30x - 120$ models the profit of the fundraiser.

What is the smallest amount, in dollars, that you can charge and make a profit of at least \$150?

$150 = -0.5x^2 + 30x - 120$

$-0.5x^2 + 30x - 270 = 0$

$$\frac{-30 \pm \sqrt{30^2 - 4(-.5)(-270)}}{2(-.5)}$$

48.97 or 11.03

$$\boxed{\$11.03}$$