

Name: Kley

Date: _____ Block: _____ # _____

Chapter 4 Review Sheet
Algebra 2

For #1-3, Graph the following. Find the vertex and create a table of values when necessary. Identify the axis of symmetry, maximum or minimum value, domain and range (remember to write both notations).

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

Vertex: (3, -5)

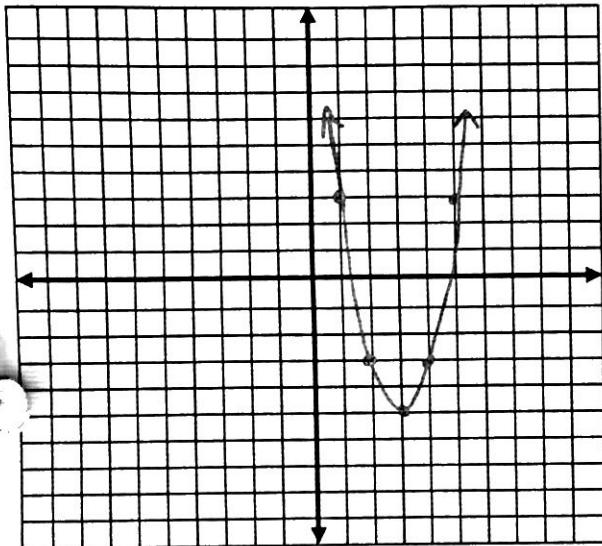
2. $f(x) = -\frac{1}{2}(x - 1)(x + 5)$

Vertex: (-2, 4.5)

$$-\frac{1}{2}(-2 - 1)(-2 + 5)$$

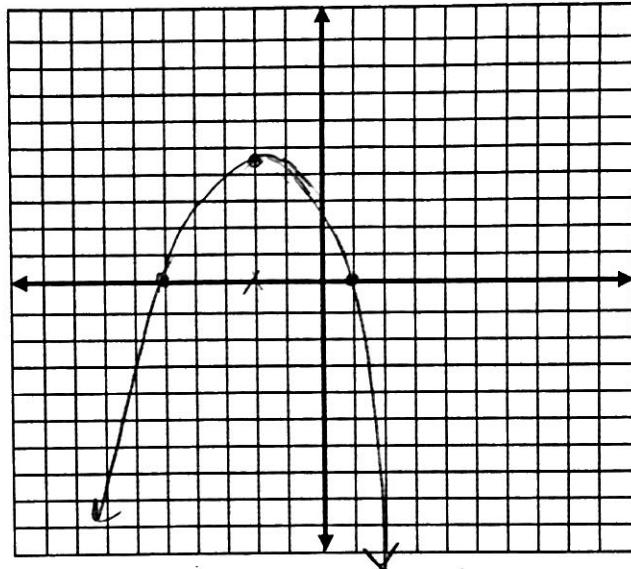
$$-\frac{1}{2}(-3)(3)$$

$$+4.5$$



x	y
1	3
2	-3
3	-5
4	-3
5	3

AOS: $x = 3$
 MAX/MIN: $K = -5$
 D: $\mathbb{R} (-\infty, \infty)$
 R: $y \geq -5$ $[-5, \infty)$



$$\begin{aligned} x-1=0 & \quad x+5=0 \\ x=1 & \quad x=-5 \end{aligned}$$

x-int $(1, 0)$ $(-5, 0)$

AOS: $x = -2$

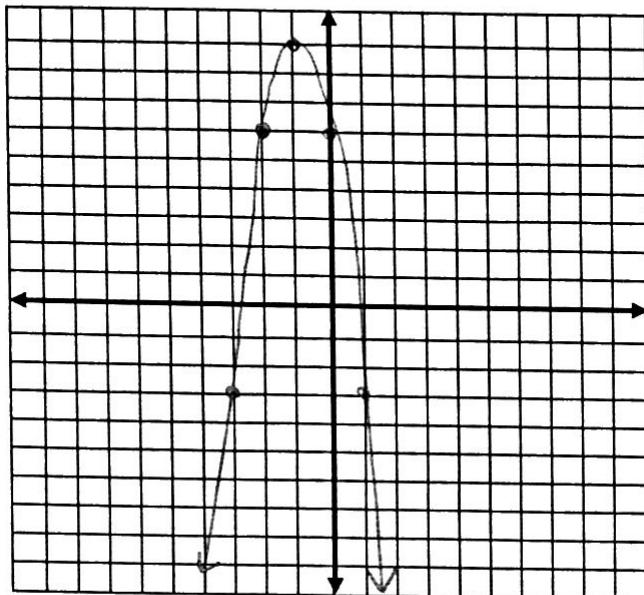
(MAX/MIN): $K = 4.5$

D: $\mathbb{R} (-\infty, \infty)$

R: $y \leq 4.5$ $(-\infty, 4.5]$

3. $y = -3x^2 - 6x + 6$

Vertex: (-1, 9)



x	y
-3	-3
-2	0
-1	9
0	6
1	-3

$$a = -3$$

$$b = -6$$

$$c = 6$$

$$x = \frac{-b}{2a}$$

$$x = \frac{b}{2(-3)}$$

$$x = -1$$

$$y = -3(-1)^2 - 6(-1) + 6$$

$$-3 + 6 + 6$$

$$9$$

$$\text{ADS: } x = -1$$

(max/min: $k = 9$)

$$D: \mathbb{R} (-\infty, \infty)$$

$$R: y \leq 9 \quad (-\infty, 9]$$

4. Write the equation for the parabola IN VERTEX FORM given that the vertex is $(2, 4)$ containing the point $(4, -8)$.

$$y = a(x-h)^2 + k$$

$$-8 = a(4-2)^2 + 4$$

$$-8 = 2^2 a + 4$$

$$-8 = 4a + 4$$

$$\underline{-4} \quad \underline{-4}$$

$$\frac{-12}{4} = \frac{4a}{4}$$

$$a = -3$$

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

Solve by finding the square roots.

5. $\sqrt{x^2} = \sqrt{324}$

$$x = \pm 18$$

6. $3x^2 - 100 = 332$

$$\underline{+100 \quad +100}$$

$$\underline{\underline{3x^2 = 432}}$$

$$\sqrt{x^2} = \sqrt{144}$$

$$x = \pm 12$$

7. $\frac{2(x+3)^2}{2} = \frac{8}{2}$

$$\sqrt{(x+3)^2} = \sqrt{4}$$

$$x+3 = \pm 2$$

$$\underline{-3 \quad -3}$$

$$\underline{\underline{x = -3 \pm 2}}$$

$$\boxed{x = -1 \quad x = -5}$$

Solve each equation.

8. $16x^2 - 40x + 25 = 64$

$$\sqrt{(4x-5)^2} = \sqrt{64}$$

$$4x-5 = \pm 8$$

$$\begin{array}{r} +5 \\ +5 \\ \hline 4x = 5 \pm 8 \end{array}$$

$$x = \frac{5 \pm 8}{4}$$

$$\begin{cases} x = \frac{13}{4} \\ x = \frac{-3}{4} \end{cases}$$

9. $100x^2 + 140x + 49 = 9$

$$\sqrt{(10x+7)^2} = \sqrt{9}$$

$$10x+7 = \pm 3$$

$$\begin{array}{r} -7 \\ -7 \\ \hline 10x = -7 \pm 3 \end{array}$$

$$x = \frac{-7 \pm 3}{10}$$

$$\begin{cases} x = \frac{-4}{10} = -\frac{2}{5} \\ x = \frac{-10}{10} = -1 \end{cases}$$

Solve each quadratic equation by completing the square

10. $x^2 + 6x - 7 = 0$

$$\begin{array}{r} +7 \quad +7 \\ \hline x^2 + 6x + 9 = 7 + 9 \end{array}$$

$$\sqrt{(x+3)^2} = \sqrt{16}$$

$$x+3 = \pm 4$$

$$\begin{array}{r} -3 \\ -3 \end{array}$$

$$x = -3 \pm 4$$

$$\boxed{x = 1 \quad x = -7}$$

11. $3x^2 + 2x + 1 = x^2 - 6x - 3$

$$\begin{array}{r} -x^2 + 6x - 1 \quad -x^2 + 6x - 1 \\ \hline 2x^2 + 8x + \underline{\quad} = -4 + \underline{\quad} \end{array}$$

$$x^2 + 4x + \frac{4}{2} = -2 + \frac{4}{2}$$

$$\sqrt{(x+2)^2} = \sqrt{2}$$

$$x+2 = \pm \frac{\sqrt{2}}{2}$$

$$\boxed{x = -2 \pm \sqrt{2}}$$

12. $-5x^2 + 10x + 20 = 0$

$$\begin{array}{r} +5x^2 - 10x \quad +5x^2 - 10x \\ \hline \end{array}$$

$$\begin{array}{r} 5x^2 - 10x + \underline{\quad} = \frac{20}{5} + \underline{\quad} \\ 5 \quad 5 \end{array}$$

$$\begin{array}{r} x^2 - 2x + \frac{1}{5} = 4 + \frac{1}{5} \\ \hline (x-1)^2 = \sqrt{5} \end{array}$$

$$x-1 = \pm \sqrt{5}$$

$$\begin{array}{r} +1 \quad +1 \\ \hline \end{array}$$

$$\boxed{x = 1 \pm \sqrt{5}}$$

Rewrite in vertex form (use completing the square).

13. $y = x^2 - 16x + 2$

$$y = x^2 - 16x + \underline{64} + 2 - \underline{64}$$

$$\begin{array}{r} (-16)^2 \\ \hline y = (x-8)^2 - 62 \end{array}$$

$$\begin{array}{l} b^2 - 4ac < 0 \rightarrow \text{no real soln} \\ = 0 \rightarrow 1 \text{ real soln.} \\ > 0 \rightarrow 2 \text{ real soln} \end{array}$$

Determine the **discriminant** of each equation. How many real solutions does the equation have?

14. $x^2 + 3x + 2 = 0$

$$\begin{array}{l} a = 1 \\ b = 3 \\ c = 2 \end{array}$$

$$b^2 - 4ac = (3)^2 - 4(1)(2) = 9 - 8 = 1$$

2 real solutions

15. $-4x^2 + 20x - 25 = 0$

$$\begin{array}{l} a = -4 \\ b = 20 \\ c = -25 \end{array}$$

$$b^2 - 4ac = (20)^2 - 4(-4)(-25) = 400 - 400 = 0$$

1 real solution

16. $3x^2 - x + 4 = 0$

$$\begin{array}{l} a = 3 \\ b = -1 \\ c = 4 \end{array}$$

$$b^2 - 4ac = (-1)^2 - 4(3)(4) = 1 - 48 = -47$$

no real solution

Solve using the **quadratic formula**.

17. $\frac{3x^2 - 4x = 2x^2 + 2}{-2x^2 - 2x - 2}$

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

$$\begin{array}{l} a = 1 \\ b = -4 \\ c = -2 \end{array}$$

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

$$x = \frac{4 \pm \sqrt{24}}{2}$$

$$x = \frac{4 \pm \sqrt{4 \cdot 6}}{2}$$

$$x = \frac{4 \pm 2\sqrt{6}}{2}$$

$$x = 2 \pm \sqrt{6}$$

18. $\frac{9x - x^2 = x^2 + 4x - 1}{-9x + x^2 + x^2 - 9x}$

$$0 = 2x^2 - 5x - 1$$

$$\begin{array}{l} a = 2 \\ b = -5 \\ c = -1 \end{array}$$

$$x = \frac{5 \pm \sqrt{(-5)^2 - 4(2)(-1)}}{2(2)}$$

$$x = \frac{5 \pm \sqrt{33}}{4}$$

19. $5x^2 + 9 = -x + 8$

$$\frac{+x - 8}{5x^2 + x + 1 = 0}$$

$$\begin{array}{l} a = 5 \\ b = 1 \\ c = 1 \end{array}$$

$$x = \frac{-1 \pm \sqrt{(1)^2 - 4(5)(1)}}{2(5)}$$

$$x = \frac{-1 \pm \sqrt{-19}}{10}$$

$$x = \frac{-1 \pm \sqrt{19}}{10}$$

Simplify the expression.

$$20. (15 - 2i) - (-7 - 5i)$$
$$\underline{15 - 2i} + \underline{-(-7 - 5i)}$$
$$22 + 3i$$

$$21. \underline{(5 - 2i)} + \underline{(3 - 5i)}$$
$$8 - 7i$$

$$22. (4 - 5i)(4 + 5i)$$
$$\underline{16 + 20i - 20i - 25i^2}$$
$$16 - 25i^2$$
$$16 - 25(-1)$$
$$41$$

$$23. (3 + i)(4 - 2i)$$
$$\underline{12 - 6i + 4i - 2i^2}$$
$$14 - 2i$$

$$24. i(3i - 5)$$
$$3i^2 - 5i$$
$$-3 - 5i$$

$$25. \frac{(2+3i)(5+7i)}{(5-7i)(5+7i)}$$

$$\frac{10 + 14i + 15i + 21i^2}{25 + 35i - 35i - 49i^2}$$
$$\frac{10 + 29i - 21}{25 - 49(-1)}$$
$$\frac{-11 + 29i}{74}$$

In #26-29, Solve using a method of your choice:

$$26. \frac{1}{2}x^2 - 10 = 0$$
$$\underline{\quad + 10 \quad + 10}$$

$$(2)\cancel{\frac{1}{2}}x^2 = 10(2)$$
$$\sqrt{x^2} = \sqrt{20}$$

$$x = \pm \sqrt{20}$$

$$x = \pm \sqrt{4 \cdot 5}$$

$$x = \pm 2\sqrt{5}$$

$$27. 2x^2 - 4x = 6$$

$$\frac{2x^2 - 4x}{2} + \underline{\quad} = \frac{6}{2} + \underline{\quad}$$

$$x^2 - 2x + \underline{\quad} = 3 + \underline{\quad}$$
$$\sqrt{(x-1)^2} = \sqrt{4}$$

$$\frac{x-1}{+1} = \frac{\pm 2}{+1}$$
$$x = 1 \pm 2$$

$$x = 3 \quad x = -1$$

28. $3x^2 - 4x + 6 = 0$

$$a = 3$$

$$b = -4$$

$$c = 6$$

$$x = \frac{4 \pm \sqrt{(-4)^2 - 4(3)(6)}}{2(3)}$$

$$x = \frac{4 \pm \sqrt{-56}}{6}$$

$$x = \frac{4 \pm \sqrt{-1} \sqrt{4} \sqrt{14}}{6}$$

$$x = \frac{4 \pm 2\sqrt{14}}{6}$$

$$\boxed{x = \frac{2 \pm \sqrt{14}}{3}}$$

29. $5x^2 - 6x - 8 = 4x^2 + 7$

$$\frac{-4x^2}{-4x^2} - 7 - 4x^2 - 7$$

$$x^2 - 6x - 15 = 0$$

$$a = 1$$

$$b = -6$$

$$c = -15$$

$$x = \frac{6 \pm \sqrt{(-6)^2 - 4(1)(-15)}}{2(1)}$$

$$x = \frac{6 \pm \sqrt{96}}{2}$$

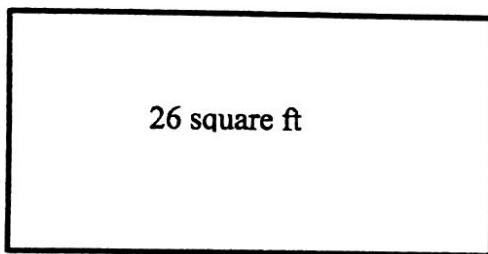
$$x = \frac{6 \pm \sqrt{16 \cdot 6}}{2}$$

$$x = \frac{6 \pm 4\sqrt{6}}{2}$$

$$\boxed{x = 3 \pm 2\sqrt{6}}$$

30. Given the figure below, find the value of x . Guess and check is not an acceptable method of solution!!

$$2x+3$$



$$x-3$$

$$(x-3)(2x+3) = 26$$

$$2x^2 + 3x - 6x - 9 = 26$$

$$2x^2 - 3x - 9 = 26$$

$$\frac{2x^2 - 3x - 35}{2x^2 - 3x - 35} = 0$$

$$(x-5)(2x+7) = 0$$

$$x = 5 \quad x = -\frac{7}{2}$$

$$\boxed{x=5}$$

31. A springboard diver's path through can be described by $y = -2.3(x - 5.7)^2 + 12.8$. What is the diver's maximum height above the water?

$$V(\underline{5.7}, 12.8)$$

$$12.8 \text{ ft}$$

32. How many real zeros does the following equation have? $y = 4x^2 - x + 8$

$$a = 4$$

$$b^2 - 4ac$$

$$b = -1$$

$$(-1)^2 - 4(4)(8)$$

no real solutions

$$c = 8$$

$$1 - 128$$

$$-127$$

33. The Brick Oven Bakery sells more ^{loaves} of bread when it reduces its price, but ^{thin} its profits change. The function $y = -100x^2 + 350x - 6.25$ models the bakery's profits, in dollars, where x is the price of a loaf of bread in dollars. The bakery wants to maximize its profits.

a) What price should the bakery charge to maximize its profits?

$$X = \frac{-350}{2(-100)} = \frac{-350}{-200} = 1.75$$

$$\$ 1.75$$

b) What is the maximum profit?

$$y = -100(1.75)^2 + 350(1.75) - 6.25$$

$$y = 300$$

$$\boxed{\$ 300}$$

34. American astronauts working on a space station on the moon toss a ball into the air. The height of the ball is represented by $f(t) = -2.7t^2 + 13.5t + 14$, where t represents time in seconds since the ball was thrown and $f(t)$ represents the height of the ball in feet. To the nearest hundredth of a second, after how much time does the ball hit the ground?

$$0 = -2.7t^2 + 13.5t + 14$$

$$a = -2.7$$

$$b = 13.5$$

$$c = 14$$

$$x = \frac{-13.5 \pm \sqrt{(13.5)^2 - 4(-2.7)(14)}}{2(-2.7)}$$

$$x = \frac{-13.5 \pm \sqrt{333.45}}{-5.4}$$

$$x = -88 \quad x = 5.88$$

5.88 seconds