Name: _____ Date: _____ Hour: ____Alg 1____

Unit 7B Day 25: Review Vertex and Standard Form of Quadratics

Focus Question: Do I remember standard and vertex form for ~~my quiz tomorrow~~?

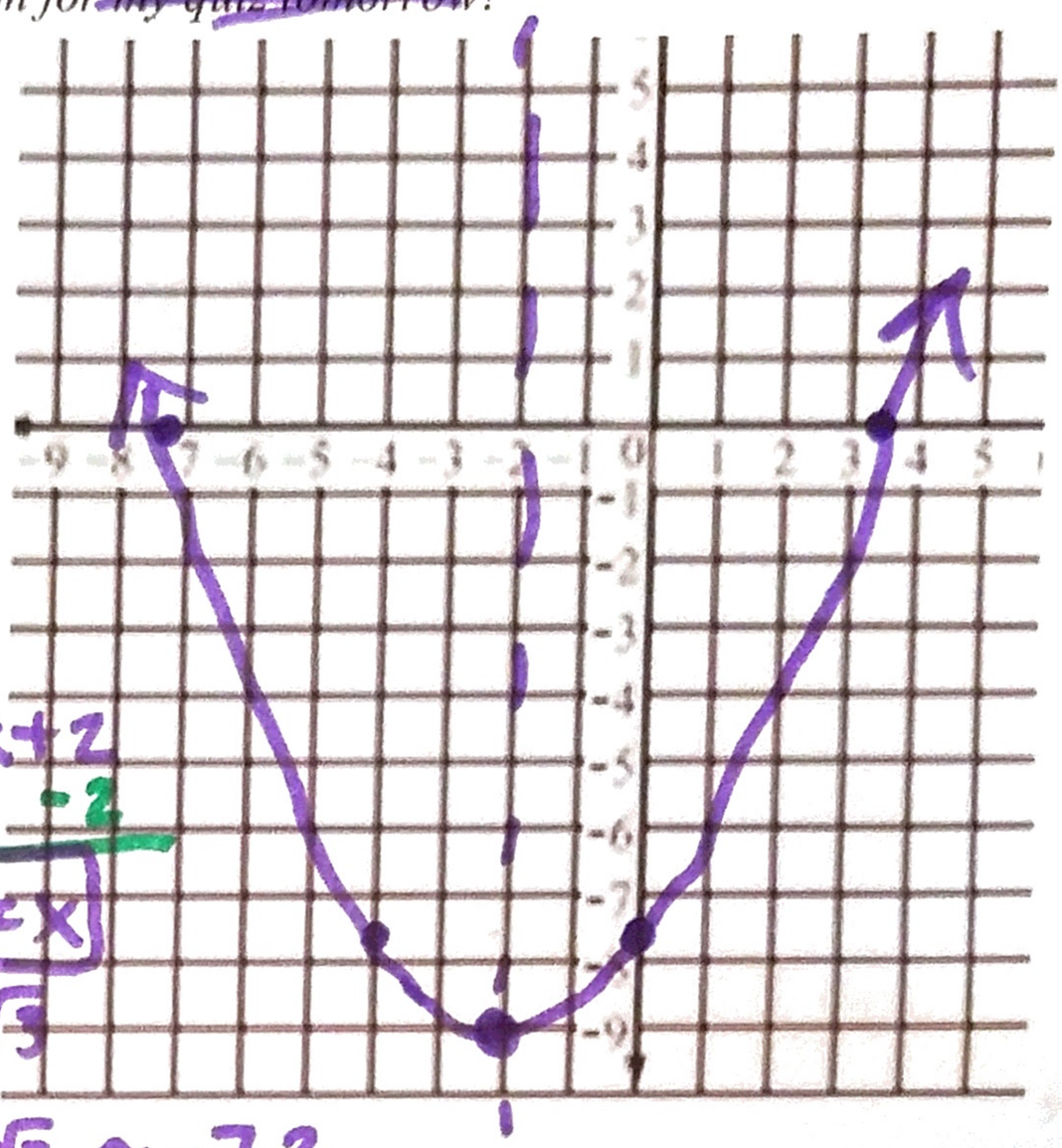
A. Vertex Form

Use the following quadratic

$f(x) = \frac{1}{3}(x+2)^2 - 9$

1. Give its vertex and a.o.s. Graph them.

(-2, -9) a.o.s. x = -2



2. Is the vertex a max or min?

$a = \frac{1}{3}$ ↑ min.

3. Solve the function.

$0 = \frac{1}{3}(x+2)^2 - 9$

$+9 \quad +9$

$3 \cdot 9 = \frac{1}{3}(x+2)^2 \cdot 3$

$\sqrt{27} = \sqrt{(x+2)^2}$

9.3

$\pm 3\sqrt{3} = x+2$

$-2 \quad -2$

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

$x = -2+3\sqrt{3} \approx 3.2$

$x = -2-3\sqrt{3} \approx -7.2$

4. What are the other names for the solutions? Graph them.

xint., zeros, roots

5. Find the y intercept and graph it.

$f(0) = \frac{1}{3}(0+2)^2 - 9 \Rightarrow \frac{4}{3} - 9 \Rightarrow \frac{4}{3} - \frac{27}{3} \Rightarrow -\frac{23}{3}$ → $(0, -\frac{23}{3})$

6. Give its domain ↔

$(-\infty, \infty)$

7. Give its range ↕

$[-9, \infty)$

8. Turn it into standard form

$\frac{1}{3}(x+2)^2 - 9$

$\frac{1}{3}(x^2+4x+4) - 9$

→ $\frac{1}{3}x^2 + \frac{4}{3}x - \frac{23}{3}$

9. You have designed a new style of sports bikes and want to figure out what price to sell them at as well as your maximum profit. The profit can be modeled by the function $P(s) = -200(s-230)^2 + 2180000$ where P is profit and s is selling price.

a. What is your maximum profit? vertex (230, 2180000) ↑ ypart $2,180,000

b. What selling price gives you the maximum profit? xpart vertex $230

c. What selling price(s) will give you no profit? (do on your own paper)

$P(s) = 0$ $s \approx \$334.40$ $s \approx \$125.60$

d. What selling price(s) will give you a profit of $1,000,000? (do on your own paper)

$P(s) = 1000000$ $306.81 or $153.19

e. What is P(0) and what does this represent in the context of the situation?

↑ yint. The start up cost

$P(0) = -200(0-230)^2 + 2180000$

$= \$-8,400,000$

(c)

$0 = -200(s-230)^2 + 2180000$

$-2180000 \qquad -2180000$

$\frac{-2180000}{-200} = \frac{-200(s-230)^2}{-200}$

$\sqrt{10900} = \sqrt{(s-230)^2}$

$\pm 104.40 \approx s - 230$

$+230 \qquad +230$

$230+104.40 \qquad 230-104.40$

$s \approx 334.40 \qquad s \approx 125.60$

(d) $100000 = -200(s-230)^2 + 2180000$

$-2180000 \qquad -2180000$

$\frac{-1180000}{-200} = \frac{-200(s-230)^2}{-200}$

$\sqrt{5900} = \sqrt{(s-230)^2}$

$\pm 76.81 \approx s - 230$

$+230 \qquad +230$

$230+76.81 \qquad 230-76.81$

$\$306.81 \qquad \$153.19$

B. Standard Form

Use the following quadratic

$j(x) = 2x^2 + 12x + 13$

1. Find the y-intercept. C (0,13)

2. Find the axis of symmetry.

$x = \frac{-b}{2a}$ $x = \frac{-12}{2(2)} \Rightarrow \frac{-12}{4}$

$x = -3$

3. Find its vertex

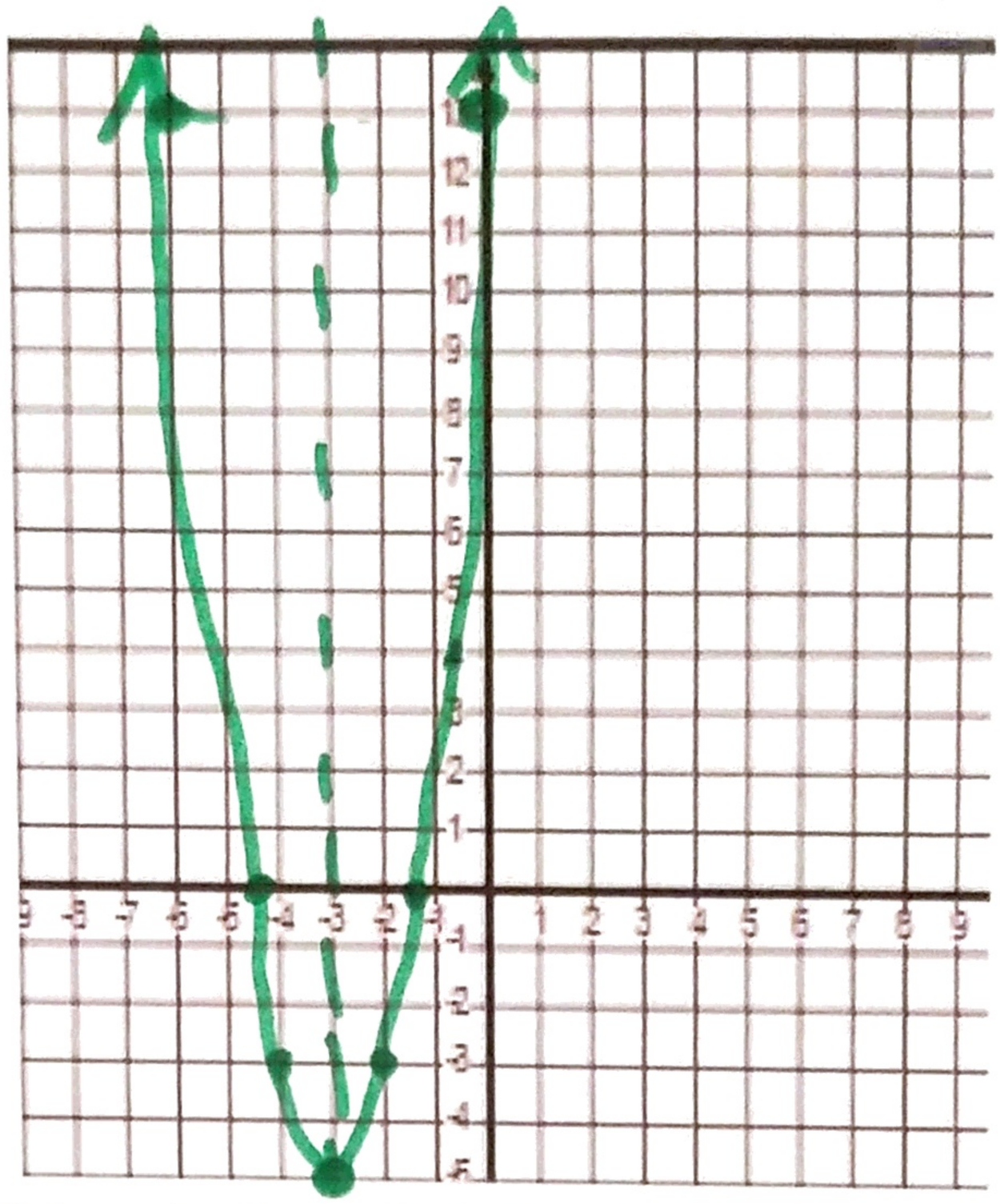
$j(-3) = 2(-3)^2 + 12(-3) + 13$

$= 2(9) - 36 + 13$

$= 18 - 23$

$= -5$

(-3,-5)



4. Is the vertex a max or min?

min

5. Solve using the quadratic formula. Then graph.

$b^2 - 4ac$

$(12)^2 - 4(2)(13)$

$144 - 104$

40

$\hat{}$

$4 \cdot 10$

$x = \frac{-12 \pm \sqrt{40}}{2(2)}$

$x = \frac{-12 \pm 2\sqrt{10}}{2(2)}$

$x = \frac{-6 \pm \sqrt{10}}{2}$

$x \approx -1.42$

$x \approx -4.58$

6. Turn it into vertex form.

$j(x) = 2x^2 + 12x + 13$

$= 2(x^2 + 6x + \frac{9}{}) + 13 - \underline{2(9)}$

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

$a = 1$

$b = 6$

$\frac{b}{2} c = 3^2$ or 9

7. Cal Ripken hit a pop up above home plate. The height of the ball, h, in feet is related to time, t, in seconds described by the function $h(t) = -16t^2 + 64t + 2$.

a. At what height was the ball when he hit it?

$t = 0$ yint → 2 ft

b. How long does an infielder have to get under the ball before it hits the ground? (Do on own paper)

$h(t) = 0$ ≈ 4.03

c. How high did the ball go? (do on own paper)

max height vertex y part 66ft.

8. Solve the following using completing the square: $3x - 15 = x^2 + 9x - 2$. Explain what your answer means

line int. parabola

they don't intersect b/c it's got 0 in it

(7b)

$0 = -16t^2 + 64t + 2$

$-2 \qquad\qquad -2$

$-2 = -16t^2 + 64t$

$\frac{-2}{-16} = \frac{-16t^2}{-16} + \frac{64t}{-16}$

$\frac{1}{8} = t^2 - 4t + 4$

$\frac{33}{8} + \frac{1}{8}$

$a = 1$
$b = -4$
$\frac{-4}{2(1)}$ $c = (-2)^2$ or 4

$\sqrt{\frac{33}{8}} = \sqrt{(t-2)^2}$

$\pm 2.03 \approx t - 2$

$+2 \qquad +2$

$2 + 2.03 = 4.03$

$2 - 2.03 = -$ time

(7c)

$x = \frac{-b}{2a} \quad \frac{-64}{2(-16)} \Rightarrow \frac{-64}{-32} \Rightarrow 2$

$h(2) = -16(2)^2 + 64(2) + 2$

$= -16(4) + 128 + 2$

$= -64 + 130$

$= 66$

(8)

$3x - 15 = x^2 + 9x - 2$

$-3x \qquad\qquad -3x$

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

$+2 \qquad\qquad +2$

$-13 = x^2 + 6x + 9$

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

$\pm 2i = x + 3$

$-3 \qquad -3$

$a = 1$
$b = 6$
$\frac{6}{2(1)} = 3$ $c = 3^2$ or 9

$x = -3 \pm 2i$