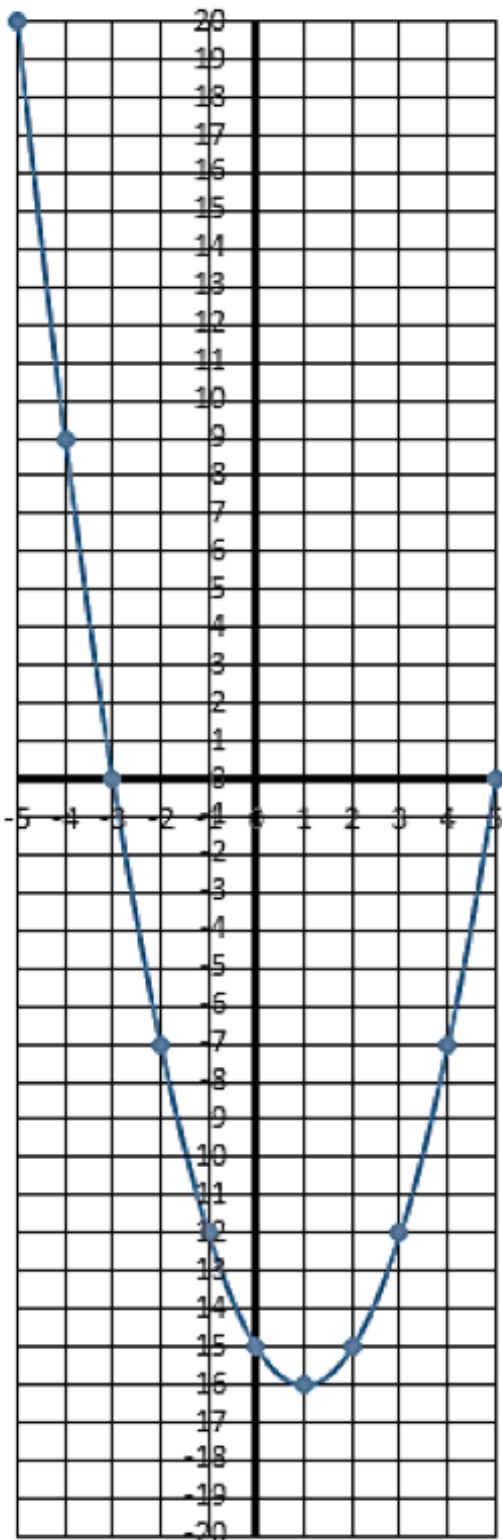NAME: _____ PERIOD: _____ DATE: _____

Homework Problem Set

1. Graph each quadratic equation given both the standard and vertex forms below.

   A. $f(x) = x^2 - 2x - 15$ or
   $f(x) = (x - 1)^2 - 16$

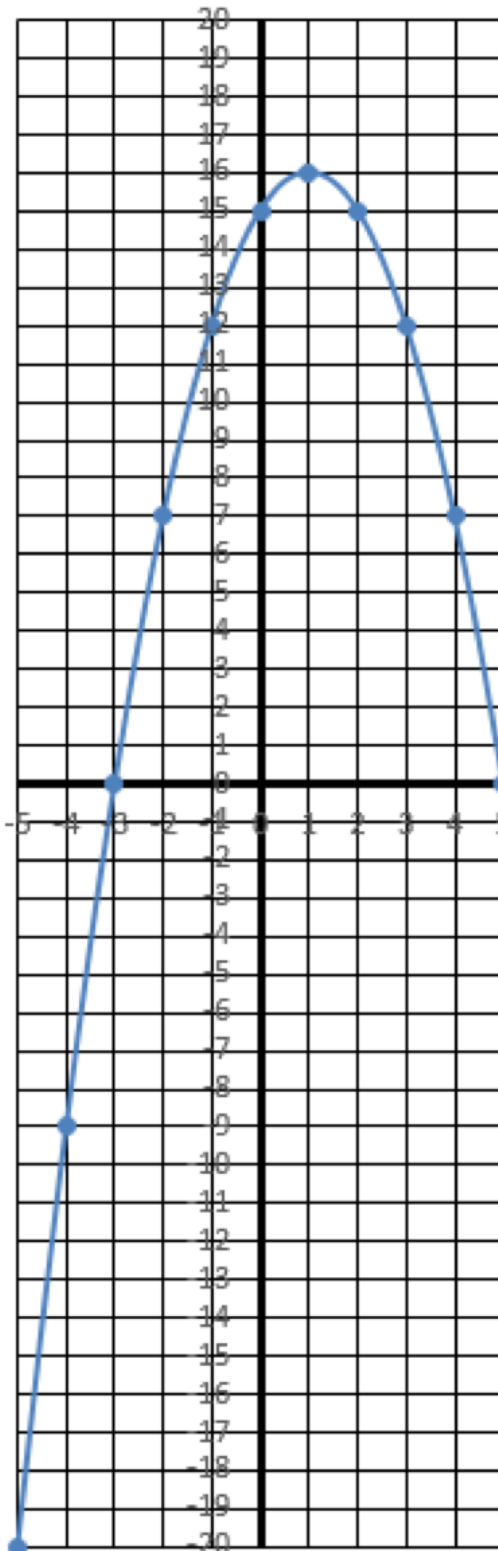   B. $f(x) = -x^2 + 2x + 15$ or
   $f(x) = -(x - 1)^2 + 16$

VERTEX:
(1, -16)

y-intercept
(0, -15)

axis of sym
x = 1

x	f(x)
3	-12
-1	-12
4	-7
-2	-7

concave up

VERTEX
(1, 16)

y-intercept
(0, 15)

axis of symmetry
x = 1

x	f(x)
3	12
-1	12
4	7
-2	7

Concave down

2. The equation in Part B of Problem 1 is the product of -1 and the equation in Part A. What effect did multiplying the equation by -1 have on the graph?

Reflection over x-axis

3. Paige wants to start a summer lawn-mowing business. She comes up with the following profit function that relates the total profit to the rate she charges for a lawn-mowing job:

$$P(x) = -x^2 + 40x - 100$$

Both profit and her rate are measured in dollars.

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A. Graph the function to help you answer the following questions. A table is given below to help you graph the function.

x	$P(x) = -x^2 + 40x - 100$
0	$p(0) = -(0)^2 + 40(0) - 100 = -100$
4	$p(4) = -(4)^2 + 40(4) - 100 = 44$
8	$p(8) = -(8)^2 + 40(8) - 100 = 156$
12	$p(12) = -(12)^2 + 40(12) - 100 = 236$
16	$p(16) = -(16)^2 + 40(16) - 100 = 284$
20	$p(20) = -(20)^2 + 40(20) - 100 = 300$
24	$p(24) = -(24)^2 + 40(24) - 100 = 284$
28	$p(28) = -(28)^2 + 40(28) - 100 = 236$
32	$p(32) = -(32)^2 + 40(32) - 100 = 156$
36	$p(36) = -(36)^2 + 40(36) - 100 = 44$
40	$p(40) = -(40)^2 + 40(40) - 100 = -100$
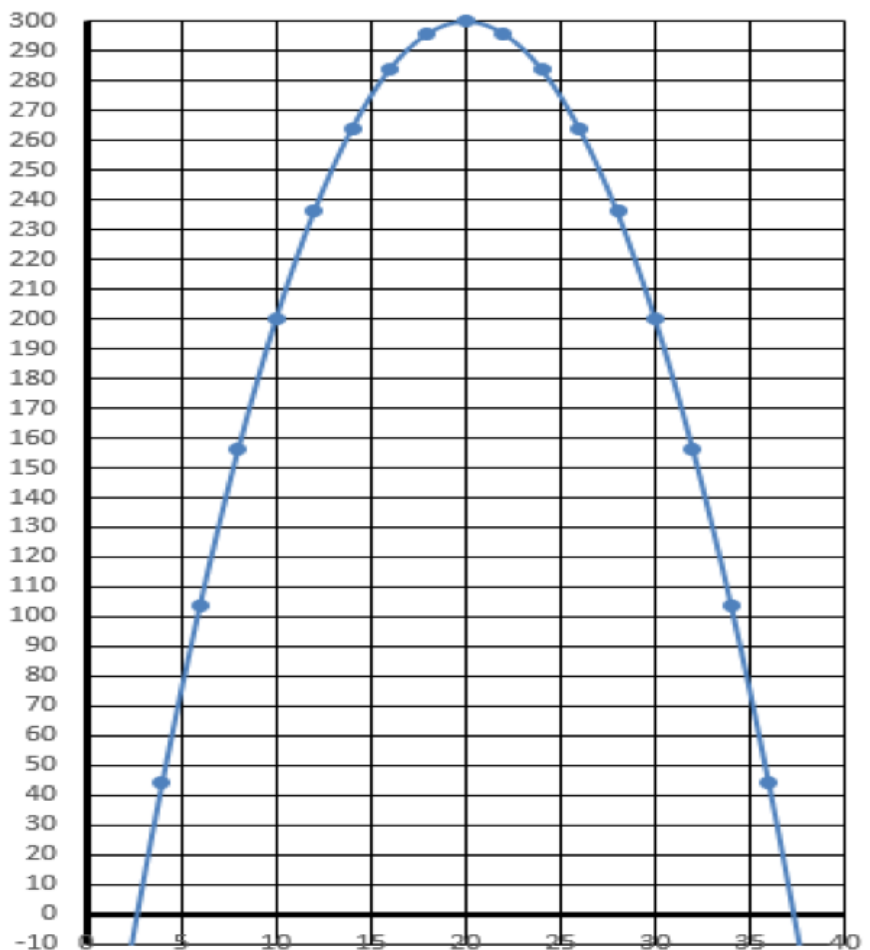
B. According to the function, what is her initial cost (e.g., maintaining the mower, buying gas, advertising)? Explain your answer in the context of this problem.

-100

It costs $100 to start her business

C. Between what two prices does she have to charge to make a profit?

Between $3 and $37

D. If she wants to make $275 profit this summer, is this the right business choice? Explain.

Yes, the vertex (20,300) shows the max profit. If she charges $20/lawn it shows max profit of $300 which is more than she wants

4. A student throws a bag of chips to her friend. Unfortunately, her friend does not catch the chips, and the bag hits the ground. The distance from the ground (height) for the bag of chips is modeled by the function $h(t) = -16(t - 1)^2 + 20$, where h is the height (distance from the ground in feet) of the chips, and t is the number of seconds the chips are in the air.

    (handwritten):
    $-16(t-1)(t-1) +20$
    $-16(t^2-2t+1)+20$
    $-16t^2-32t-16+20$
    $-16t^2-32t+4$

    A. Graph $h(t) = -16(t - 1)^2 + 20$.

    B. From what height are the chips being thrown? Explain how you know.

    (handwritten): 4 ft
    y-intercept:
    At 0 seconds, the height is 4 feet

    (handwritten, right of graph):
    vertex (1, 20)
    y-intercept (0,4)

t	h(t)
0.5	16
1.5	16

    C. What is the maximum height the bag of chips reaches while airborne? Explain how you know.

    (handwritten): 20 feet
    Vertex is a maximum · function

    D. About how many seconds after the bag was thrown did it hit the ground?

    (handwritten): between 2 and 2.5 seconds

    E. What is the average rate of change of height for the interval from 0 to $\frac{1}{2}$ second? What does that number represent in terms of the context?

    (handwritten):
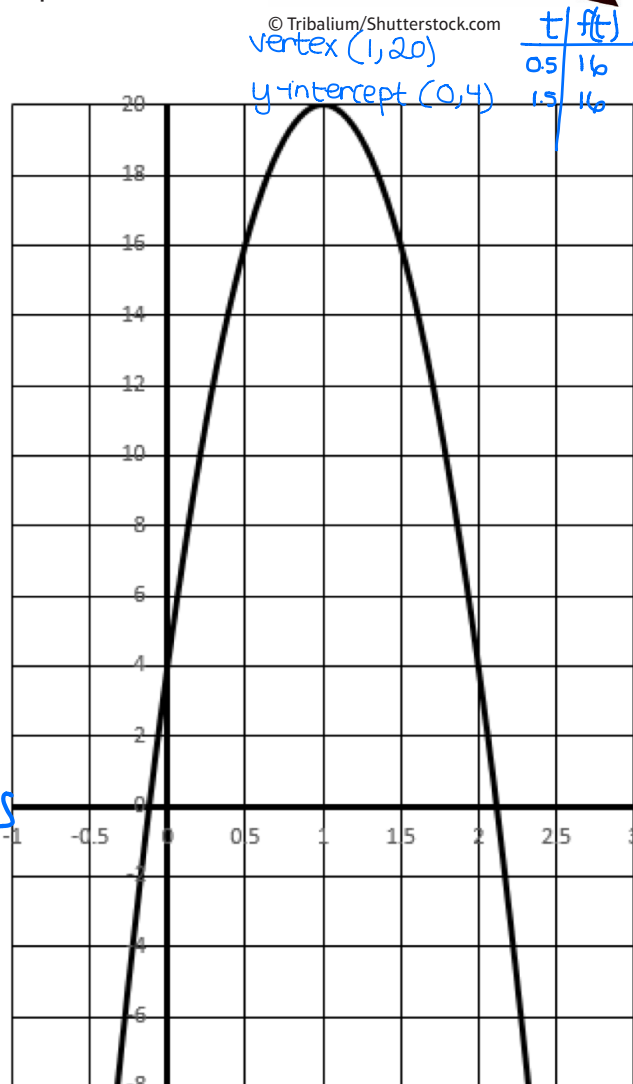 $f(0) = 4$
    $f(0.5) = 16$
    $\dfrac{16-4}{0.5-0} = \dfrac{12}{0.5} = 24$ ft/sec

    From 0–0.5 sec. the average speed of the bag is 24 ft/sec.

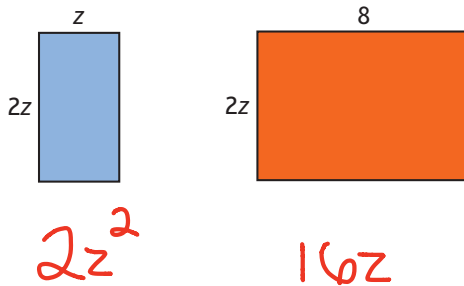   F. Based on your answer to Part E, what is the average rate of change for the interval from 1.5 to 2 sec.?
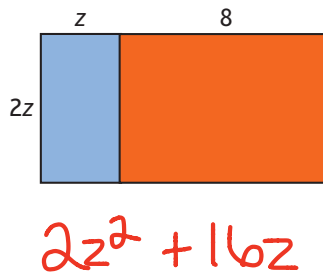
    (handwritten): -24 ft/sec.

Spiral REVIEW—Writing Expressions for Area

5. Write expressions for the areas of the two rectangles in the figures given below.

z | 8

$2z$ | $2z$

$2z^2$ $16z$

6. Write an expression for the area of this rectangle:

z 8

$2z$

$2z^2 + 16z$

7. Katy says that the two expressions in Problems 5 and 6 must be the same. Support or oppose Katy's statement with evidence.

$$2z^2 + 16z = 2z(z+8)$$