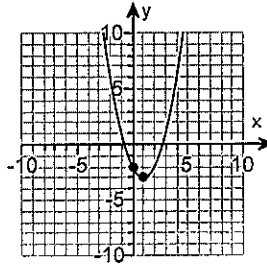


Student: _____ Date: _____	Instructor: Joe Betters Course: Pre-Calculus Pre AP (Master Course)	Assignment: 3.3-3.4 Classwork
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1. Determine the quadratic function whose graph is given.

The vertex is $(1, -3)$.
 The y-intercept is $(0, -2)$.



$f(x) =$ _____ (Simplify your answer.)

ID: 3.3.49

2. For the function $g(x) = -2(x - 2)^2 + 3$, answer parts (a) through (c).

(a) Graph $g(x) = -2(x - 2)^2 + 3$. Use the graphing tool to graph the function.

(b) Determine the domain and range of the function.

The domain is _____.
 (Type your answer in interval notation.)

The range is _____.
 (Type your answer in interval notation.)

(c) Determine where the function is increasing and where it is decreasing.

Determine where the function is increasing. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

A. The function is increasing on the interval _____.
 (Type your answer in interval notation.)

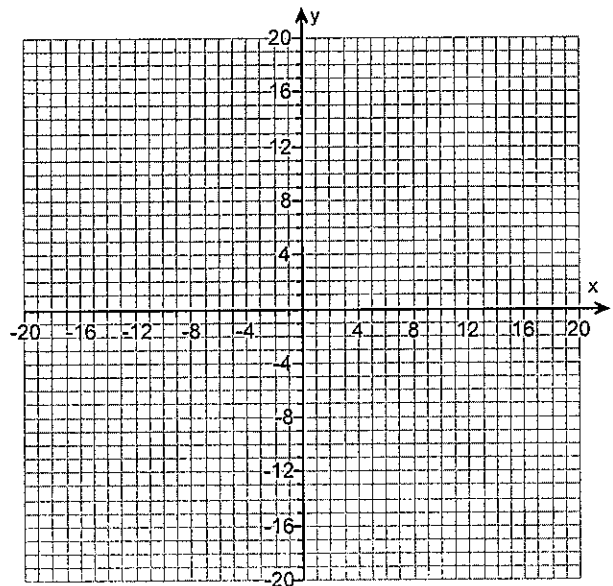
B. The function is never increasing.

Determine where the function is decreasing. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

A. The function is decreasing on the interval _____.
 (Type your answer in interval notation.)

B. The function is never decreasing.

ID: 3.3.65



3. Find the point on the line $y = x$ that is closest to the point $(-4, 0)$.

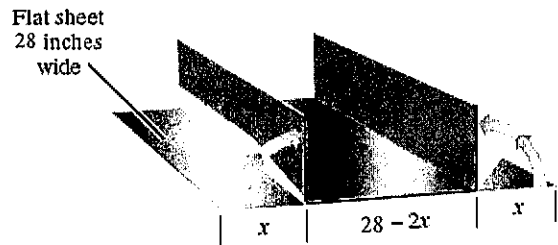
[Hint: Express the distance d from the point to the line as a function of x , and then find the minimum value of $[d(x)]^2$.]

The point is (_____ , _____).

ID: 3.3.85

4. A rain gutter is to be made of aluminum sheets that are 28 inches wide by turning up the edges 90° . See the illustration.

- (a) What depth will provide maximum cross-sectional area and hence allow the most water to flow?
 (b) What depths will allow at least 66 square inches of water to flow?



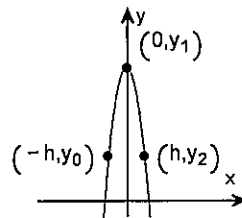
(a) The depth that will provide the maximum cross-sectional area is _____ inches.

(b) The depths between _____ in. and _____ in. will allow at least 66 square inches of water to flow.

ID: 3.4.15

5. The figure shows the graph of $y = -ax^2 + bx + c$. Suppose that the points $(-h, y_0)$, $(0, y_1)$, and (h, y_2) are on the graph. The area enclosed by the parabola, the x -axis, and the lines $x = -h$ and $x = h$ may be given by the following formula.

$$\text{Area} = \frac{h}{3} (y_0 + 4y_1 + y_2)$$



Find the area enclosed by $f(x) = -6x^2 + 9$, the x -axis, and the lines $x = -1$ and $x = 1$.

The area is _____.
 (Type an integer or a fraction.)

ID: 3.4.21

6. An individual's income varies with age. The table shows the median income I of individuals of different age groups within the United States for a certain year. For each age group, let the class midpoint represent the independent variable x . For the class "65 years and older," assume that the class midpoint is 69.5.

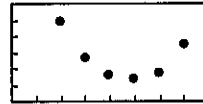
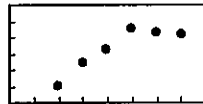
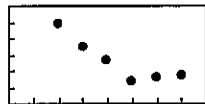
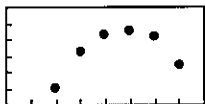
Age	Class Midpoint, x	Median Income, I
15-24 years	19.5	\$10,963
25-34 years	29.5	\$33,132
35-44 years	39.5	\$43,638
45-54 years	49.5	\$45,693
55-64 years	59.5	\$42,478
65 years and older	69.5	\$24,502

Complete parts (a) through (e).

(a) Use a graphing utility to draw a scatter diagram of the data. Comment on the type of relation that may exist between the two variables.

Choose the correct answer below.

- A. B. C. D.



[0, 80, 10] by [0, 60000, 100000]

Which type of relation exists between the two variables?

- A. Linear with negative slope
 B. Quadratic with $a > 0$
 C. Linear with positive slope
 D. Quadratic with $a < 0$

(b) Use a graphing utility to find the quadratic function of best fit that models the relation between age and median income.

The quadratic function of best fit is $y = \underline{\hspace{2cm}}x^2 + \underline{\hspace{2cm}}x - \underline{\hspace{2cm}}$.
 (Type integers or decimals rounded to three decimal places as needed.)

(c) Use the function found in part (b) to determine the age at which an individual can expect to earn the most income.

At about years of age, the individual can expect to earn the most income.
 (Do not round until the final answer. Then round to the nearest tenth as needed.)

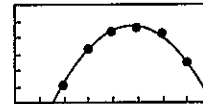
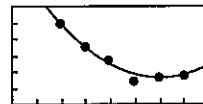
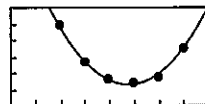
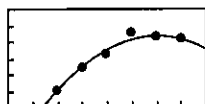
(d) Use the function in part (b) to predict the peak income earned.

The predicted peak income is about \$.
 (Round to the nearest dollar as needed.)

(e) With a graphing utility, graph the quadratic function of best fit on the scatter diagram.

Which of the following shows the quadratic function of best fit?

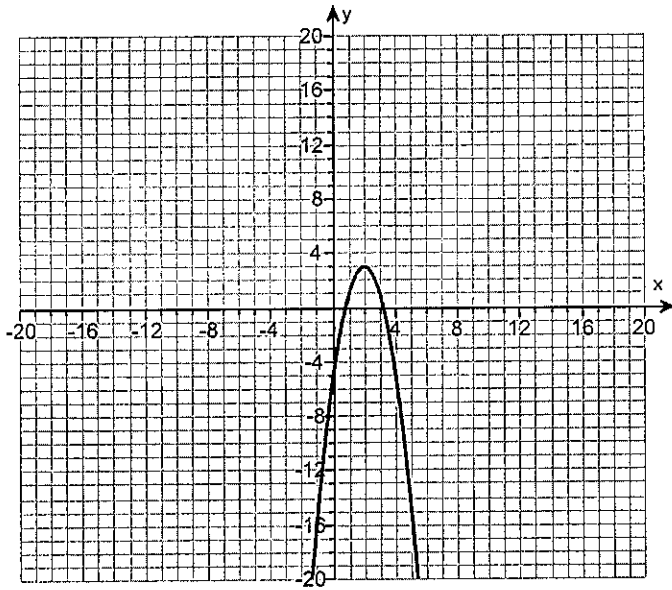
- A. B. C. D.



[0, 80, 10] by [0, 60000, 100000]

ID: 3.4.25

1. $x^2 - 2x - 2$



2.

$(-\infty, \infty)$

$(-\infty, 3]$

A. The function is increasing on the interval $(-\infty, 2)$. (Type your answer in interval notation.)

A. The function is decreasing on the interval $(2, \infty)$. (Type your answer in interval notation.)

3. -2

-2

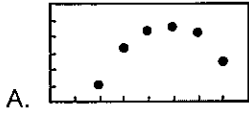
4. 7

3

11

5. 14

6.



D. Quadratic with $a < 0$

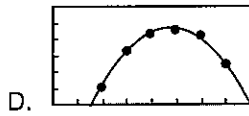
- 45.644

4341.752

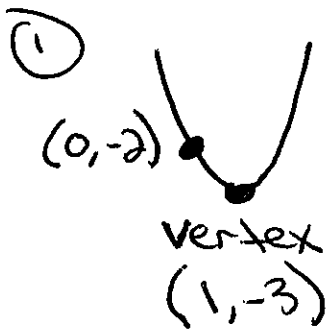
56106.527

47.6

47,143



3.3-3.4 classwork



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

$$-2 = a(0-1)^2 - 3$$

$$a = 1$$

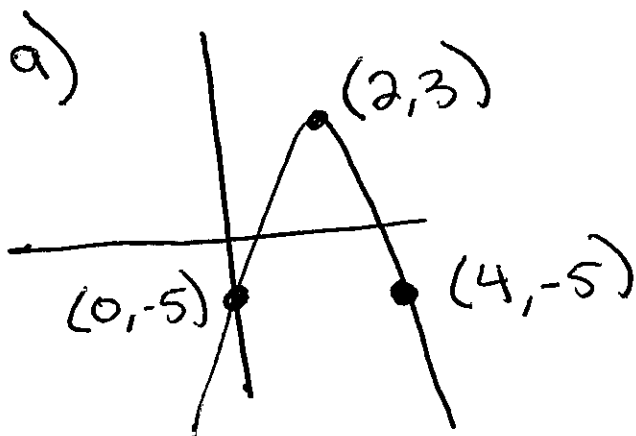
$$f(x) = (x-1)^2 - 3$$

$$f(x) = x^2 - 2x - 2$$

② $g(x) = -2(x-2)^2 + 3$

vertex $(h, k) = (2, 3)$

y-int = $-2(0-2)^2 + 3 = (0, -5)$



b) Domain $(-\infty, \infty)$

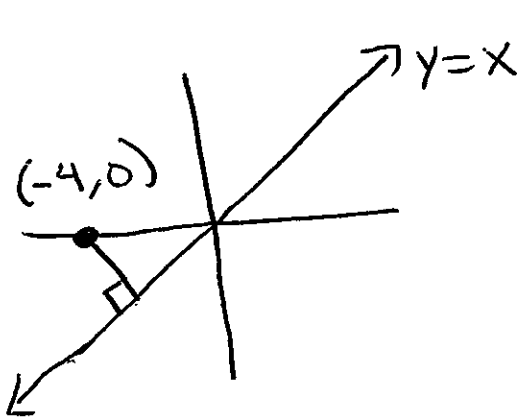
Range $(-\infty, 3]$

c) Increasing
 $(-\infty, 2)$

Decreasing
 $(2, \infty)$

3.3-3.4 classwork continued

③ $y = x$ and point $(-4, 0)$



$$m_{\perp} = -1$$

~~scribble~~

$$y = mx + b$$

$$0 = -1(-4) + b$$

$$b = -4$$

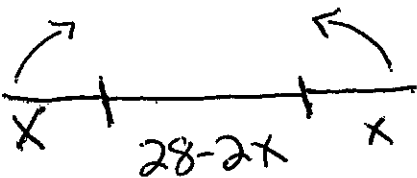
$$y = -x - 4$$

$$x = -x - 4$$

$$x = -2$$

$$\boxed{(-2, -2)}$$

④



$$A = LW$$

$$A = x(28 - 2x)$$

$$A = -2x^2 + 28x$$

a) $x = \frac{-b}{2a} = \frac{-28}{(2)(-2)} = \boxed{7 \text{ inches}}$

b) $66 = -2x^2 + 28x$

$$2x^2 - 28x + 66 = 0$$

$$x^2 - 14x + 33 = 0$$

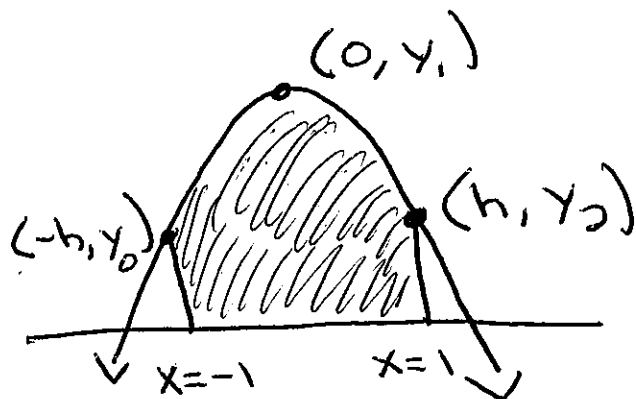
$$(x - 3)(x - 11) = 0$$

$$x = 3 \quad x = 11$$

$\boxed{\text{between } 3 \text{ and } 11 \text{ inches}}$

3.3-3.4 classwork continued

$$\textcircled{5} A = \frac{h}{3} (y_0 + 4y_1 + y_2)$$



Find Area enclosed
by $f(x) = -6x^2 + 9$,
x-axis, $x = -1$, $x = 1$

$$f(x) = -6x^2 + 9$$

$$y_0 = -6(-1)^2 + 9 = 3$$

$$y_1 = -6(0)^2 + 9 = 9$$

$$y_2 = -6(1)^2 + 9 = 3$$

$$h = x = 1$$

$$A = \frac{h}{3} (y_0 + 4y_1 + y_2)$$

$$A = \frac{1}{3} (3 + 4(9) + 3)$$

$$A = 14 \text{ units}^2$$

3.3-3.4 classwork continued

⑥ * use calculator

Age	Class Midpoint, x	Median Income, I
15-24 years	19.5	\$10,963
25-34 years	29.5	\$33,132
35-44 years	39.5	\$43,638
45-54 years	49.5	\$45,693
55-64 years	59.5	\$42,478
65 years and older	69.5	\$24,502

a) Graph A



Quadratic with $a < 0$ D

b) Line of best fit

$$y = -45.644x^2 + 4341.752x - 56106.527$$

c) ~~vertex~~

$$x = \frac{-b}{2a} = \frac{-4341.752}{2(-45.644)} = \boxed{47.6} \text{ years}$$

d) $y = -45.644(47.6)^2 + 4341.752(47.6) - 56106.527$

$= \boxed{\$47,143}$

e) Graph D

