

Take out Yesterday's Packet...
Chapter 3 review 1

Name: _____

Chapter 3 Review 1

Per: _____

1. Determine whether each function is linear or no linear. If the function is linear, determine the equation of the line.

$y = 2x + 3$

x	-2	-1	0	1	2
y	-1	1	3	5	7

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - (-1)}{-1 - (-2)} = \frac{2}{1} = 2$$

$$\frac{5 - 3}{1 - 0} = \frac{2}{1} = 2$$

x	0	1	2	3	4
y	1	2	4	8	16

non
linear

$$\frac{2 - 1}{1 - 0} = \frac{1}{1} = 1$$

$$\frac{8 - 4}{3 - 2} = \frac{4}{1} = 4$$

2. $f(x) = 2(x-1)^2 + 1$

$\rightarrow 2(x^2 - 2x + 1) + 1$

a. opens up or down?

$2x^2 - 4x + 3$

UP

b. axis of symmetry

$\frac{-b}{2a} = \frac{4}{2(2)} = 1 = x$

$1 = x$

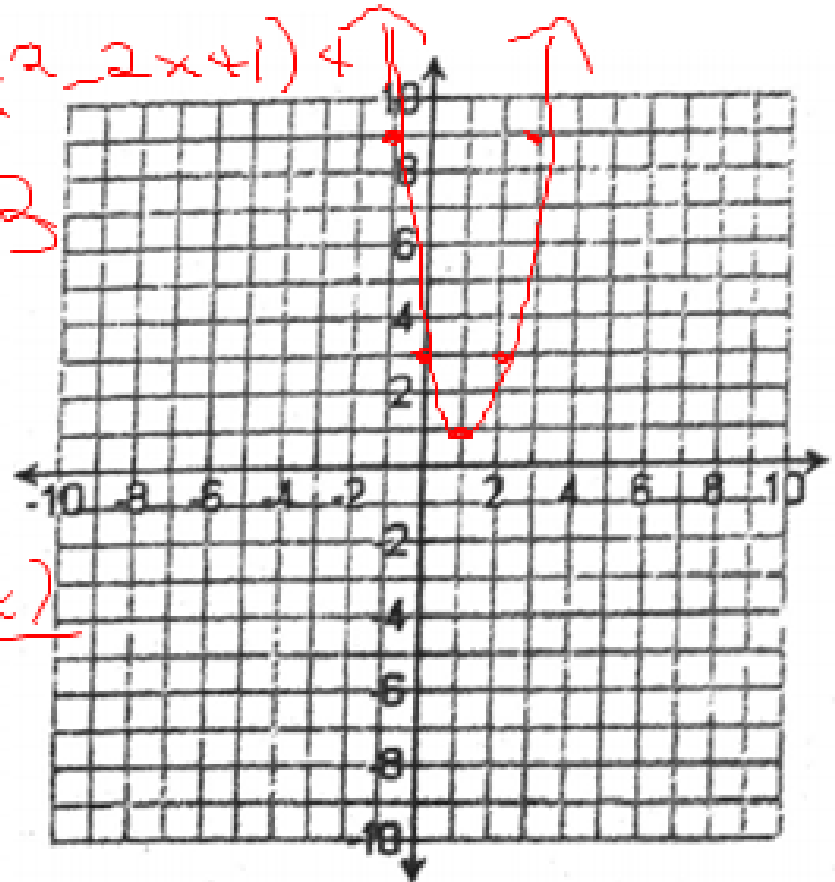
c. Vertex

$(1, 1)$

d. Domain =

Range = \mathbb{R}
 $y \geq 1$

x	f(x)
2	3
3	9
4	19



3. $f(x) = -x^2 + 10x - 18 - (5)^2$ e. Graph the function

a. opens up or down? $-25 + 50 - 18$

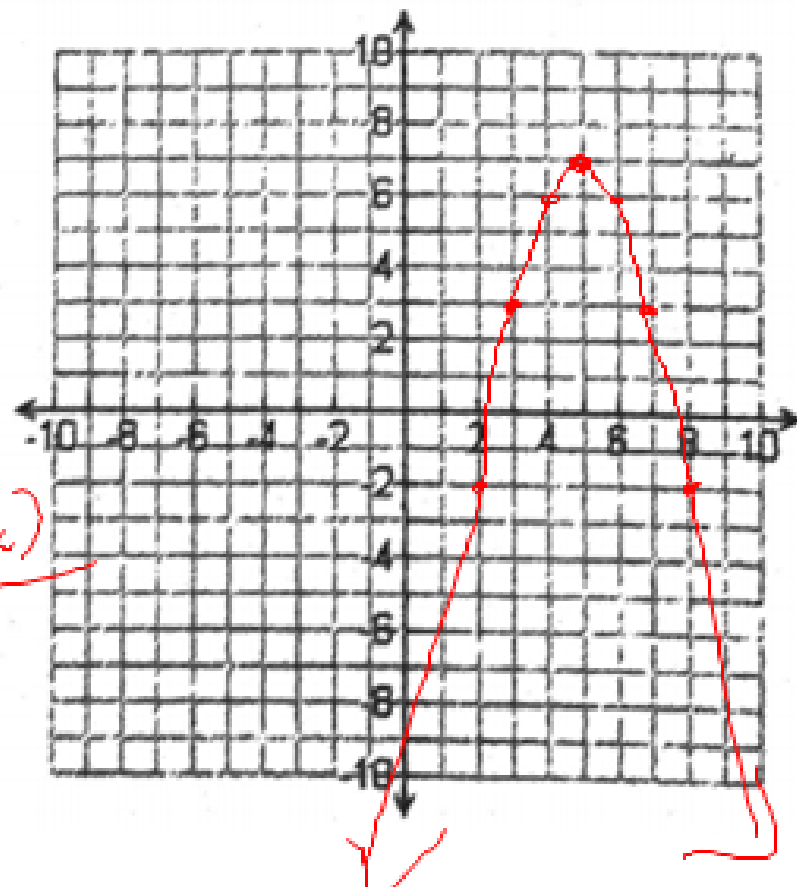
b. axis of symmetry *down*

c. Vertex $\frac{-b}{2a} = \frac{-10}{2(-1)} = \boxed{5 = x}$

d. Domain = $(5, 7)$

Range = \mathbb{R}
 $y \leq 7$

x	f(x)
6	6
7	3
8	-2



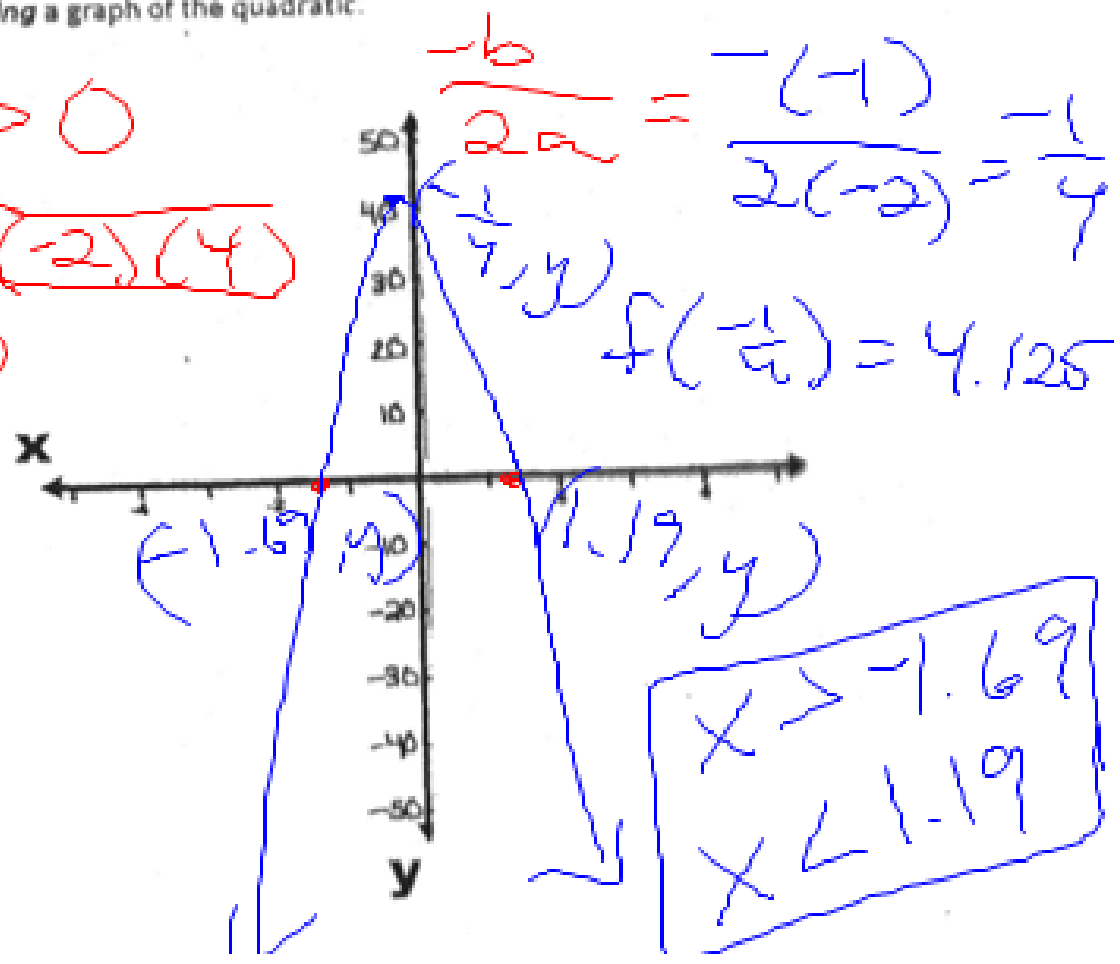
4. Solve the inequality and verify your results by sketching a graph of the quadratic.

$$-2x^2 - x + 4 > 0$$

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

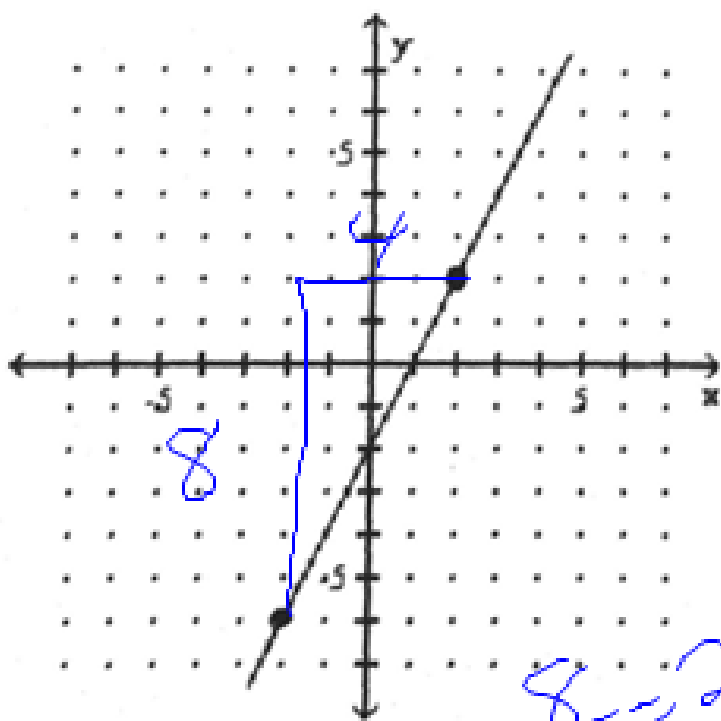
$$x = \frac{1 \pm \sqrt{33}}{-4}$$

-1.69 1.19



Write the equation of each function graphed below.

5.



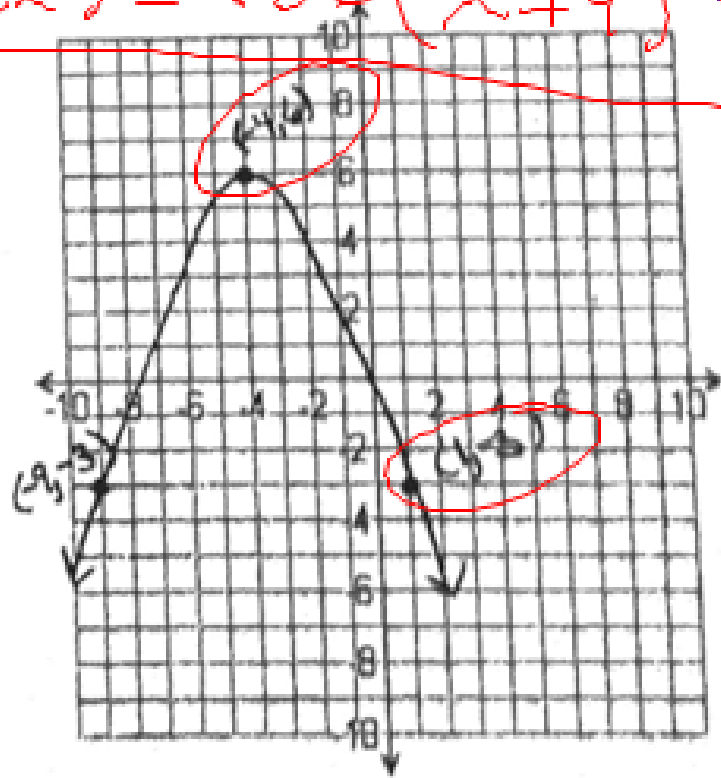
$$\frac{8}{4} = 2$$

$$y = mx + b$$

$$y = 2x - 2$$

6.

$$f(x) = -0.36(x+4)^2 + 6$$



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

$$-3 = a(1+4)^2 + 6$$

$$-3 = a(25) + 6$$

$$-3 = 25a + 6$$

$$-9 = 25a \quad \text{or}$$

$$a = \frac{-9}{25} = -0.36$$

7. The following data represents the amount of money Tom is saving each month since he graduated from college.

a. Using a graphing utility, draw a scatter diagram of the data treating the # of months as the independent variable. What type of relation appears to exist between months and savings?

month	1	2	3	4	5	6	7
savings	\$52	\$70	\$81	\$91	\$102	\$118	\$132

b. Based on your response to part a, find either a linear or quadratic model that describes the relation between # of months and savings. If your model is linear, state the strength of the model using the correlation coefficient.

$$y = 12.75x + 41.29$$

c. $r = .996$ so strong linear relationship
Use your model to predict how much Tom will have saved after 9 months.

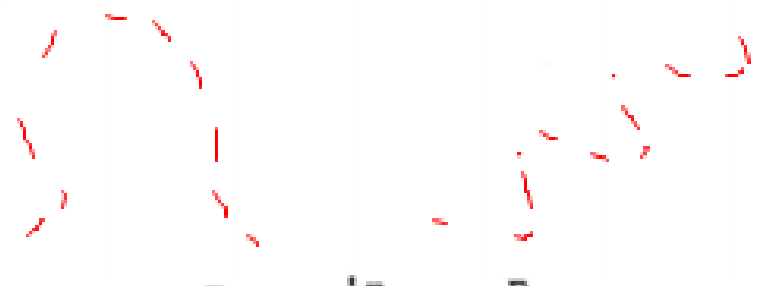
$$y = 12.75(9) + 41.29$$

$$= 156.04$$

$$a =$$

$$b =$$

$$r =$$



8. The data at the right represents the price, x , of a textbook as the number of buyers, b , increases.

Price, x	Buyers, B
\$20	30
\$30	50
\$40	65
\$60	75
\$80	72
\$100	50
\$110	25

- a. Using a graphing utility, draw a scatter diagram of the data treating Price as the independent variable. What type of relation appears to exist between the price of a textbook and the # of buyers.

Quadratic

- b. Based on your response to part a, find either a linear or quadratic model that describes the relation between the price and the number of buyers for textbooks... If your model is linear, state the strength of the model using the correlation coefficient.

$$y = -.02x^2 + 3.12x - 22.13$$

- c. Use your model to predict the number of buyers when the price of a textbook is \$75.

$$y(75) = -.02(75)^2 + 3.12(75) - 22.13$$

$$= 99.37 \approx \boxed{99 \text{ buyers}}$$

$a =$
 $b =$
 $c =$

The price p (in dollars) and the quantity x sold of a certain product obey the demand equation $p = \frac{1}{10}x + 1000$.

a. Find a model that expresses the revenue R as a function of x .

$$R = x \cdot p = x \left(\frac{1}{10}x + 1000 \right) \rightarrow R(x) = -\frac{1}{10}x^2 + 1000x$$

b. What is the revenue if 400 units are sold.

$$R(400) = -\frac{1}{10}(400)^2 + 1000(400) = \$384,000$$

c. What quantity x maximizes revenue? What is the maximum revenue?

$$x = \frac{-1000}{2(-\frac{1}{10})} = \frac{-1000}{-1/5} = 5000 \quad R(5000) = \$2,500,000$$

d. What price should the company charge to maximize revenue?

$$p = -\frac{1}{10}(5000) + 1000 = \$500$$

$R(x)$
 $y(x)$

10. A biologist would like to know how the age of the mother affects the incidence rate of Down syndrome. The data to the right represent the age of the mother and the incidence rate of Down syndrome per 1000 pregnancies.



Age of Mother, x	Incidence of Down Syndrome, y
33	2.4
34	3.1
35	4
36	5
37	6.7
38	8.3
39	10
40	13.3
41	16.7
42	22.2
43	28.6
44	33.3
45	50

- a. Create a scatter diagram in your calculator treating age of the mother as the independent variable. Would it make sense to find the line of best fit for these data or quadratic regression equation?

①

Quadratic Regression

- b. Find the best model to fit the data using your calculator.

①

$$y = 0.413x^2 - 28.884x + 507.578$$

Source: Hook, E.B., *Journal of the American Medical Association*, 249, 2034-2038, 1983.

- c. Use your model to estimate the incidence of Down Syndrome if the age of the mother is 30. Round to the nearest tenth.

①

$$I(30) \approx 0.413(30)^2 - 28.884(30) + 507.578$$

$$\approx 13.1$$

$$\approx 12.758$$

Extra Credit!

For the following functions: $f(x) = x^2 - x - 2$ and $g(x) = x^2 + x - 2$ find indicated inequality solution set.

a. $f(x) = g(x)$

$$x^2 - x - 2 = x^2 + x - 2$$

$$-x - 2 = x - 2$$

$$0 = 2x$$

$$x = 0$$

$$(0, -2)$$

b. $f(x) < g(x)$

$$x^2 - x - 2 < x^2 + x - 2$$

$$-x - 2 < x - 2$$

$$0 < 2x$$

$$x > 0$$