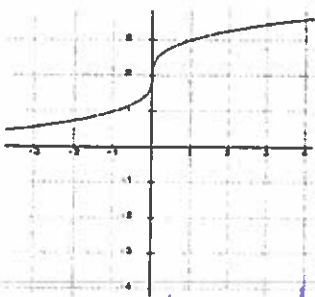
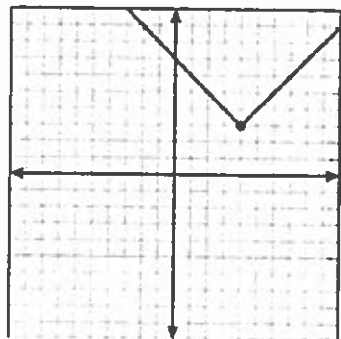


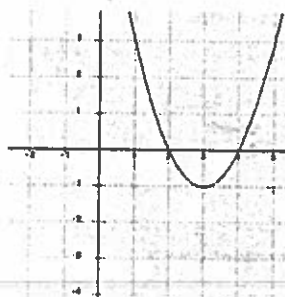
Key

Common Core Regents Review Functions

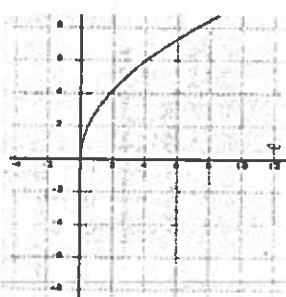
- ♦ A **relation** is any set of ordered pairs. A **function** is a relation in which each input, x has exactly one output, $f(x)$. The variable x is a member of the **domain** of the function, the first number in the ordered pair, it is the independent variable for the function; $f(x)$ is a member of the **range** of the function, the second number in the ordered pair, it is the dependent variable for the function. If a graph passes the **vertical line test** then it is a function.
- ♦ Graphs of functions take on many different forms: linear, quadratic, absolute value, exponential, both growth and decay, cubed, cubed root, square root, piecewise and step functions. These functions can be shifted and stretched by adjusting the coefficients and adding or subtracting constants.



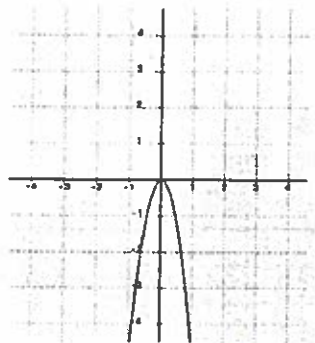
Function cube root



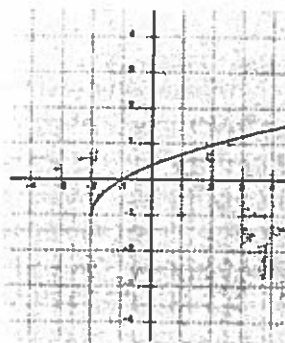
Function quad.



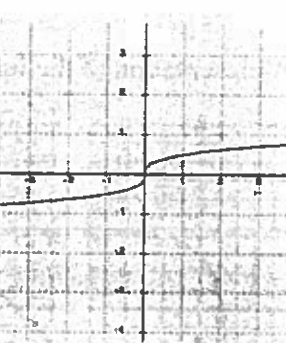
Function square root



Function quad.

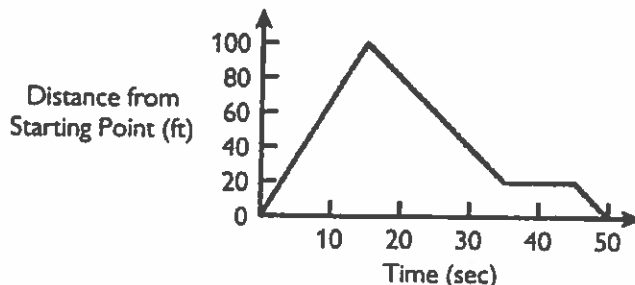
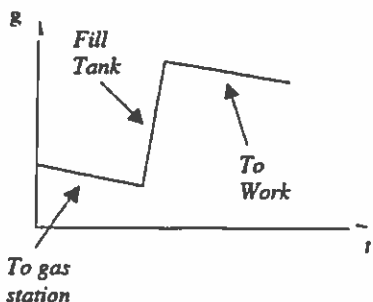


Function square root

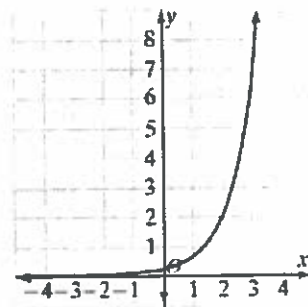
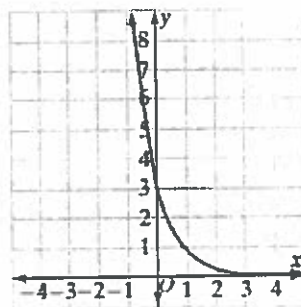


Function cube root

- ♦ **Qualitative graphs** relate situations on a graph without a formula or equation

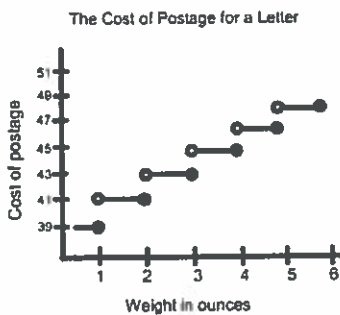
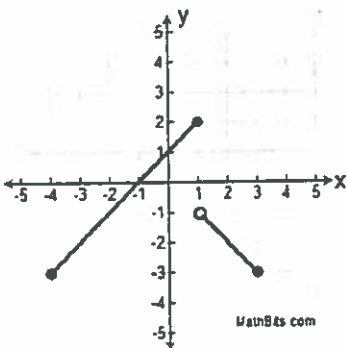


◆ An **exponential function** is a function of the form, $y = b^x$, where b is positive and the variable is contained in the exponent. When $b > 1$, then the exponential function increases; when $0 < b < 1$, then the exponential function decreases. Growth and decay word problems are shown by the following formula:



◆ $y = A(1 \pm r)^x$, where A is the initial value, r is the rate of growth (+) or decay (-) and x is time period given in the problem.

◆ **Step and Piecewise** functions define the function in “pieces” or “steps”.

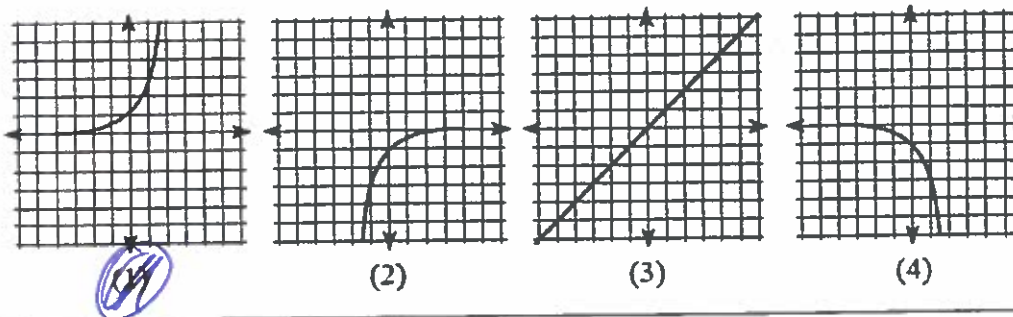


$$f(x) = \begin{cases} x, & x < -2 \\ x-1, & -2 \leq x \leq 0 \end{cases}$$

Regents Review

1. Which graph is a correct representation of the function $f(x) = 3^x$?

put into calc look at graph



2. The graph of the equation $y = 3^x$ contains which point?

- (1) (1,9) (2) $(-2, \frac{1}{9})$ (3) (2,6) (4) $(-3, \frac{1}{9})$

3. Which function represents exponential decay?

- (1) $f(x) = 100(.9)^x$ (2) $f(x) = 10(1.09)^x$ (3) $f(x) = 1.9^x$ (4) $f(x) = \frac{1}{2}(9)^x$

less than 1 means decay

$$1.00 - .045 = .955$$

4. A car depreciates (loses value) at a rate of 4.5% annually. Greg purchased a car for \$12,500. Which equation can be used to determine the value of the car, V , after 5 years?

- (1) $V = 12,500(0.55)^5$ (2) $V = 12,500(0.955)^5$ (3) $V = 12,500(1.045)^5$ (4) $V = 12,500(1.45)^5$

5. A bank is advertising that new customers can open a savings account with a $3\frac{1}{2}\%$ interest rate compounded annually. Robert invests \$5000 in an account at this rate. If he makes no additional deposits or withdrawals on his account, find the amount of money he will have, to the nearest cent, after three years.

3.5%
↓
.035

$$A = 5000\left(1 + \frac{.035}{1}\right)^{1 \cdot 3}$$

$$A = 5000(1 + .035)^3 \quad \$ 5543.59$$

$$A = \$554.36$$

6. Joseph conducted a science experiment involving the growth of bacteria. He measured the number of bacteria hourly for 6 hours. The data is summarized in the accompanying table. What type of regression would best fit the data?

- (1) Linear (2) Exponential (3) Quadratic (4) Absolute Value

$r \approx .94$ $r \approx .99$

Hour	Number of Bacteria
0	300
1	470
2	725
3	1150
4	1800
5	2750
6	4400

7. Is the equation $A = 21000(1 - 0.12)^t$ a model of exponential growth or exponential decay, and what is the rate (percent) of change per time period?

- (1) exponential growth and 12% (2) exponential growth and 88%
 (3) exponential decay and 12% (4) exponential decay and 88%

$$0.12 = 12\%$$

8. Mr. Smith invested \$2500 in a savings account that earns 3% interest compounded annually. He made no additional deposits or withdrawals. Which expression can be used to determine the number of dollars in this account at the end of 4 years?

- (1) $2500(1 + 0.03)^4$ (2) $2500(1 + 0.3)^4$ (3) $2500(1 + 0.04)^4$ (4) $2500(1 + 0.4)^4$

$$3\% \rightarrow .03$$

9. Daniel's Print Shop purchased a new printer for \$35,000. Each year it depreciates (loses value) at a rate of 5%. What will its approximate value be at the end of the fourth year?

- (1) \$33,250.00 (2) \$30,008.13 (3) \$28,507.72 (4) \$27,082.33

$$35000(1 - .05)^4$$

$$28507.72$$

10. Which relation is *not* a function?

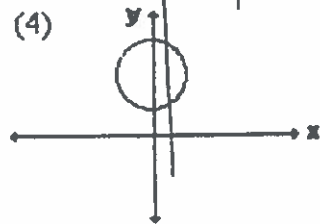
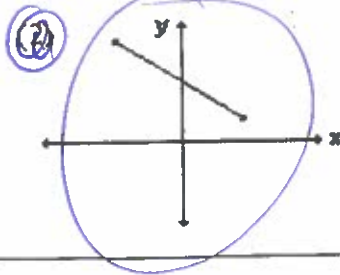
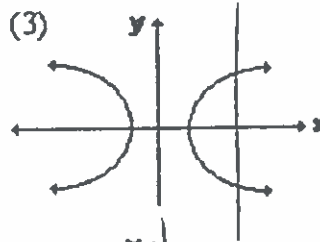
(1) $\{(1,5), (2,6), (3,6), (4,7)\}$

(2) $\{(-1,6), (1,3), (2,5), (1,7)\}$

(3) $\{(3,4), (2,1), (-3,6), (4,7)\}$

(4) $\{(-1,2), (5,0), (0,5), (2,-1)\}$

11. Which graph of a relation is also a function?



12. Miller Brothers Plumbing Inc. charges by the hour or part of an hour as follows for repairs:

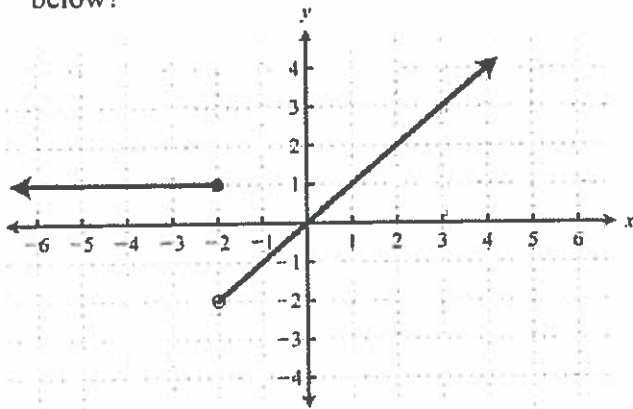
$$\text{Total charge for repairs} \begin{cases} \$75 & \text{if } 0 < h \leq 1 \\ \$75 + 50(h-1) & \text{if } h > 1 \end{cases}$$

$75 + 50(4-1)$

If h represents the number of hours worked, what is the charge for a 4 hour repair?

- (1) \$75 (2) \$125 (3) \$175 (4) \$225

13. What is the rule for the piecewise function shown below?



Using the graph left find the values of the function given the domain values (x) indicated

$f(-4) = 1$

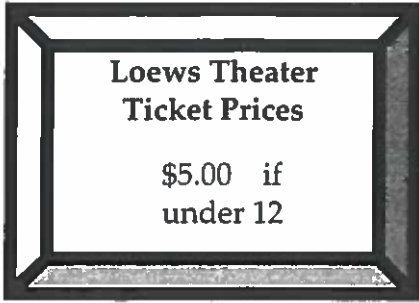
$f(-2) = 1$

$f(0) = 0$

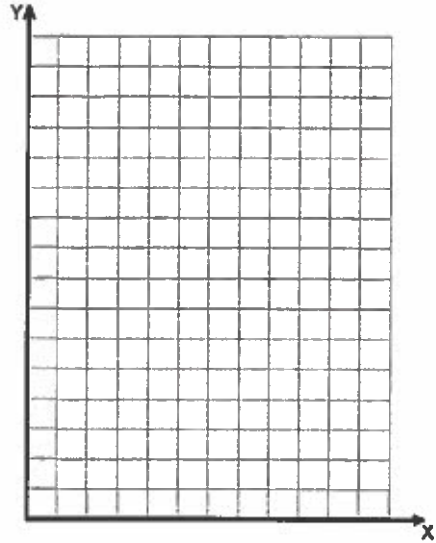
$f(3) = 3$

(1) $\begin{cases} 1 & \text{if } x \leq -2 \\ x & \text{if } x > -2 \end{cases}$ (2) $\begin{cases} 1 & \text{if } x < -2 \\ x & \text{if } x \geq -2 \end{cases}$

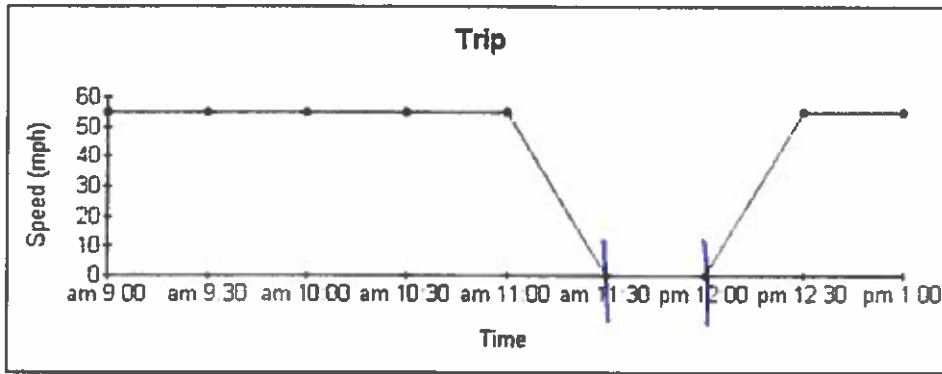
14. Graph the step function for the movie theater charges shown on the sign. Be sure to label your axes.



$$f(x) = \begin{cases} 5.00 & \text{if } x < 12 \end{cases}$$

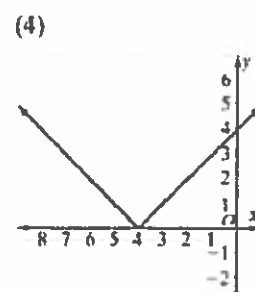
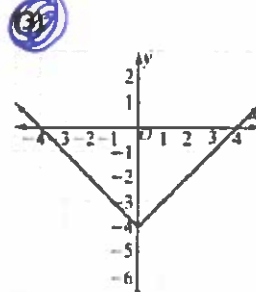
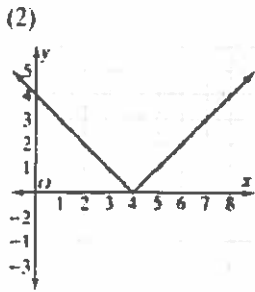
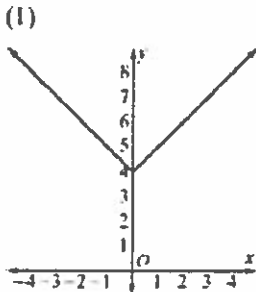


15. Sharon and John are making a line graph of their trip to New Orleans. They plotted their speed every half hour. What do you think happened from 11:30 to 12:00?

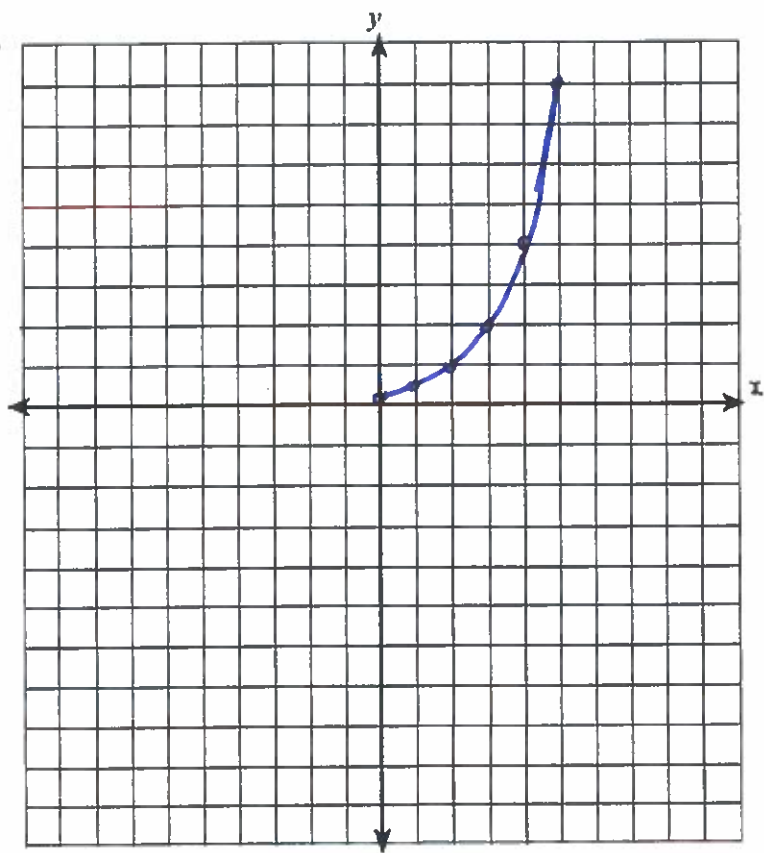


- A. They reached their destination.
 B. They left the highway to stop for lunch.
 C. They increased their speed.
 D. They decreased their speed.

16. Which of the following is the graph of $y = |x| - 4$?



17. a) Sketch the graph of all of the solutions to the equation $y = \frac{1}{4}(2)^x$, where $0 \leq x \leq 5$.



x	y
0	0.25
1	0.5
2	1
3	2
4	4
5	8

b) Find the average rate of change between $f(2)$ and $f(5)$.

~~$f(2)$~~

$$\frac{8-1}{5-2} = \boxed{\frac{7}{3}}$$

x	y
2	1
5	8