Warm up

1 If $f(t) = 3t^2 - 2$, find $f(k-2)$.

(A) $3k^2 - 12k + 12$ (B) $3k^2 - 8$ (C) $3k^2 - 4k + 2$

(D) $3k^2 - 4$ (E) None of these

2 An equation of a graph obtained from vertically shrinking the graph of $y = \sqrt{x}$ then shifting the graph up twenty units is:

(A) $y = \frac{5}{3}\sqrt{x} + 20$ (B) $y = \sqrt{\frac{7}{2}x + 20}$ (C) $y = \frac{3}{4}\sqrt{x} + 20$

(D) $y = 2\sqrt{x + 20}$ (E) None of these

$y = \frac{C}{4x-1}$

$x = \frac{C}{4y-1}$

$4y - 1 = \frac{C}{4x} + 1$

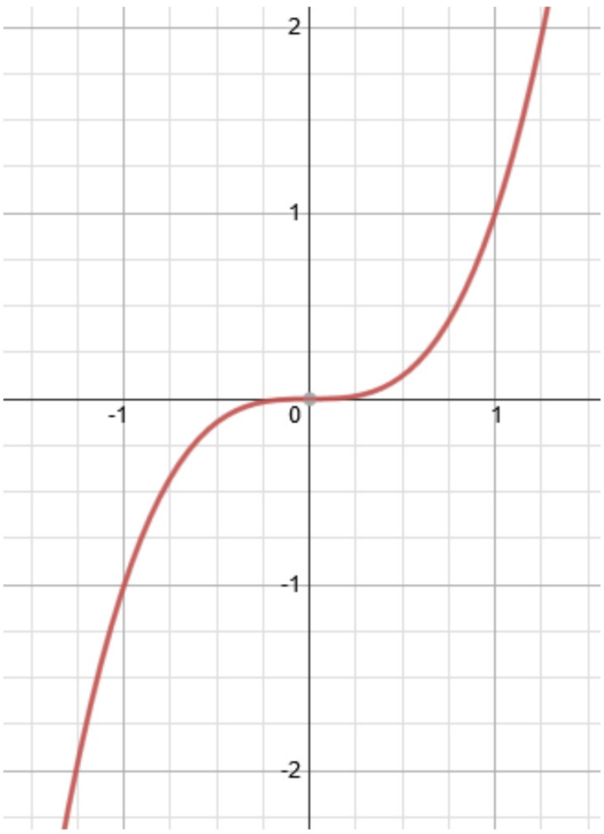
3 Find $Q^{-1}(t)$ if $Q(t) = \frac{C}{4t-1}$. (C is a nonzero real number)

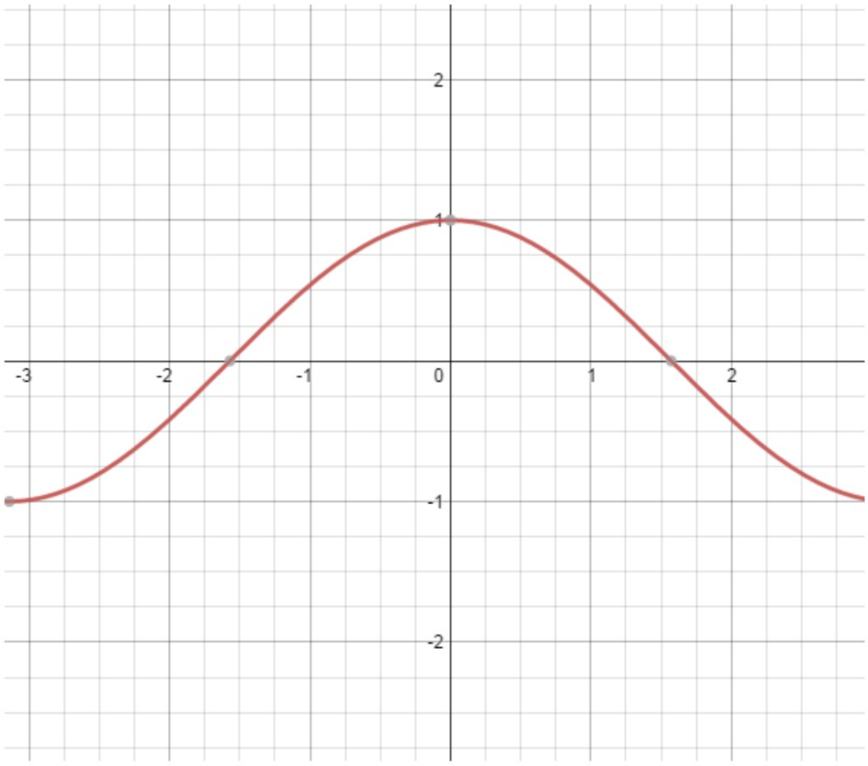
(A) $Q^{-1}(t) = \frac{C}{4}t + C$ (B) $Q^{-1}(t) = \frac{4t-1}{C}$ (C) $Q^{-1}(t) = \frac{C+t}{4t}, t \neq 0$

(D) $Q^{-1}(t) = \frac{C-4t}{t}, t \neq 0$ (E) None of these

Homework

Functions

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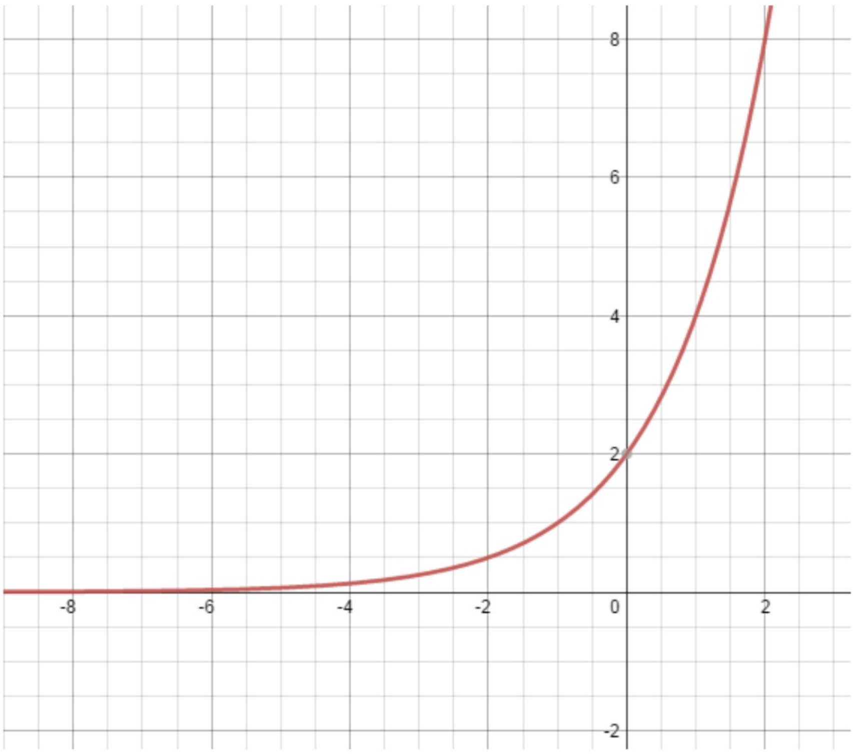
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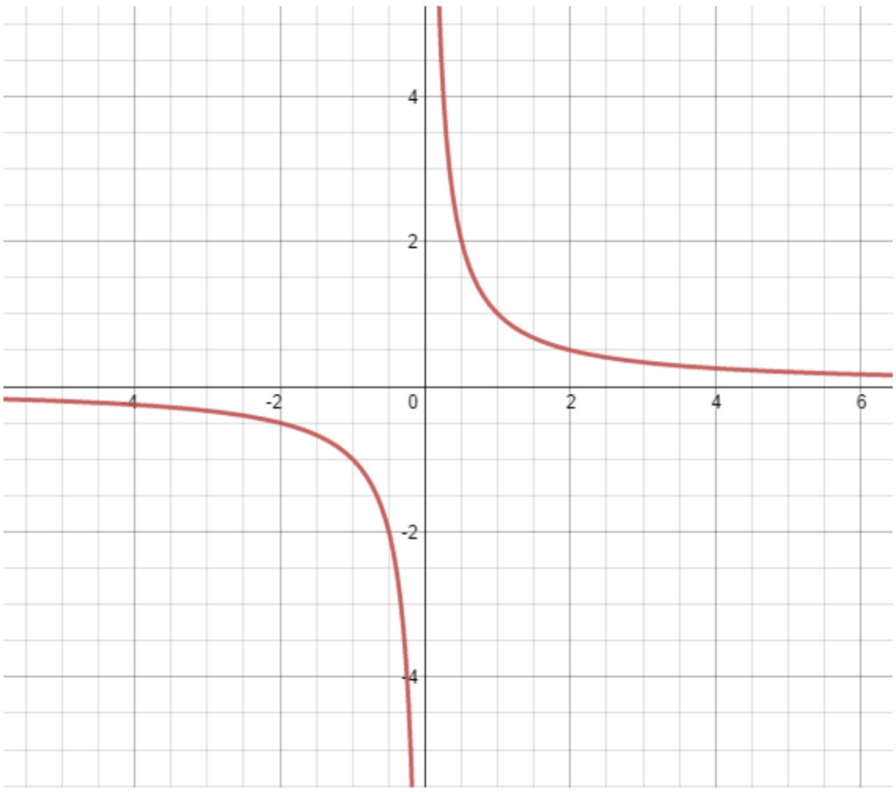
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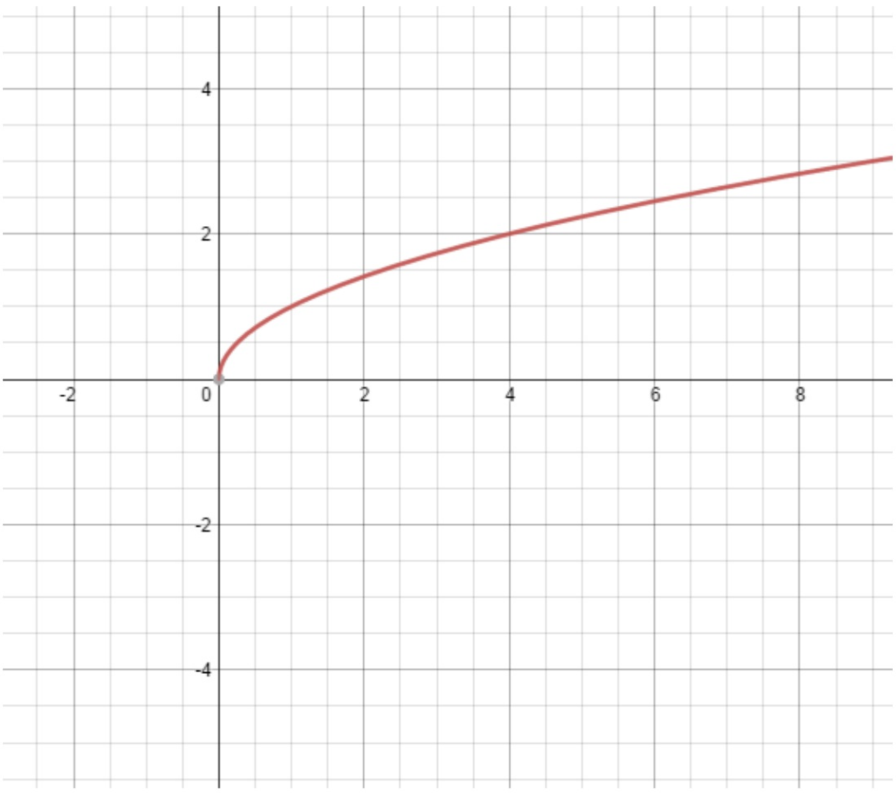
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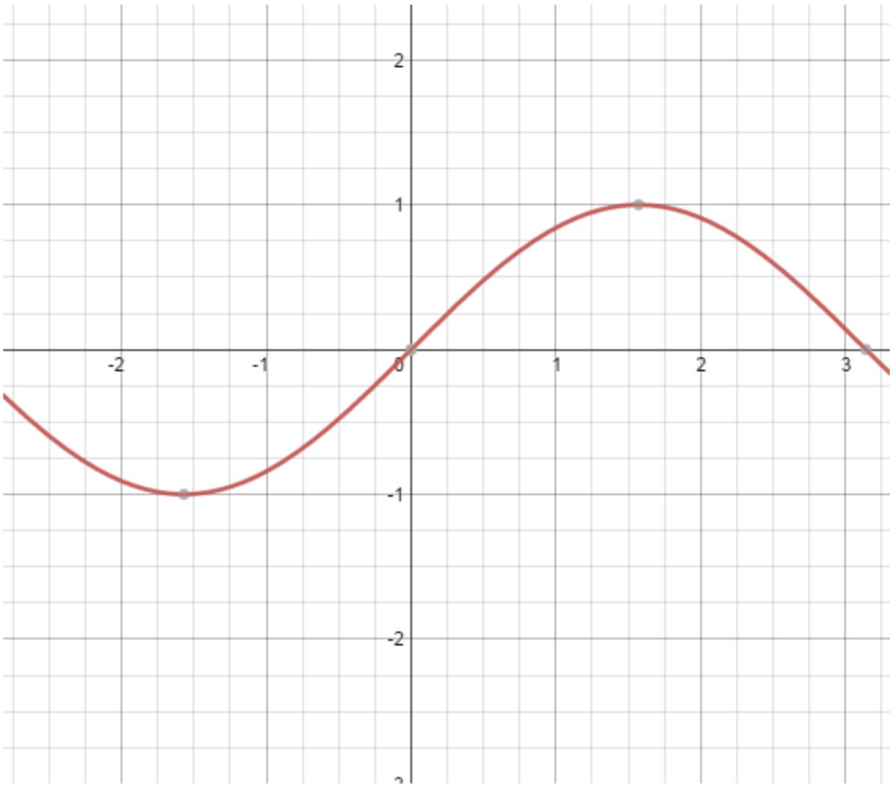

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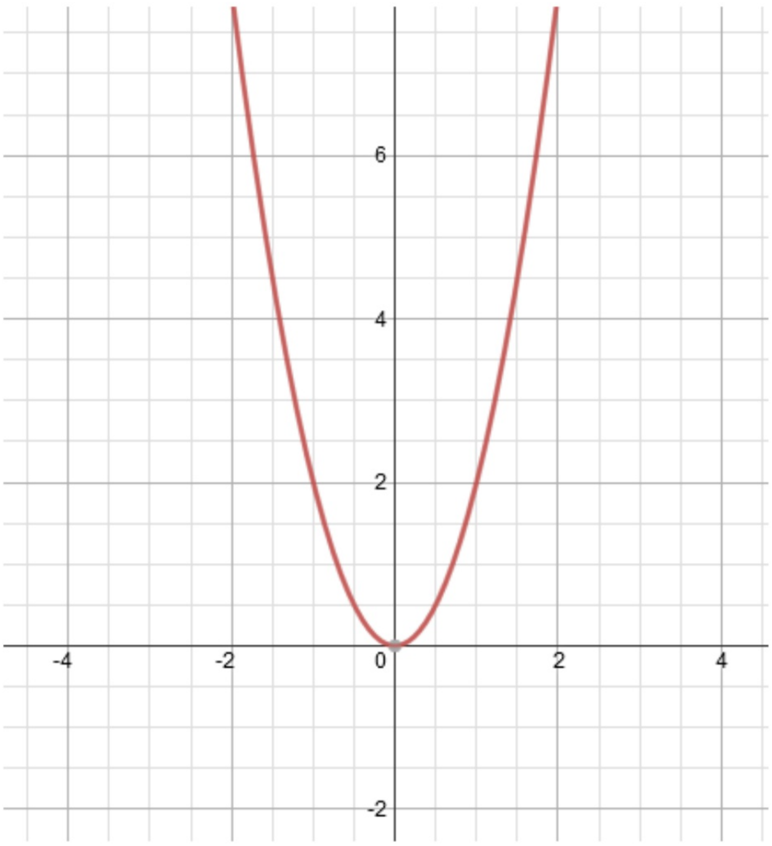

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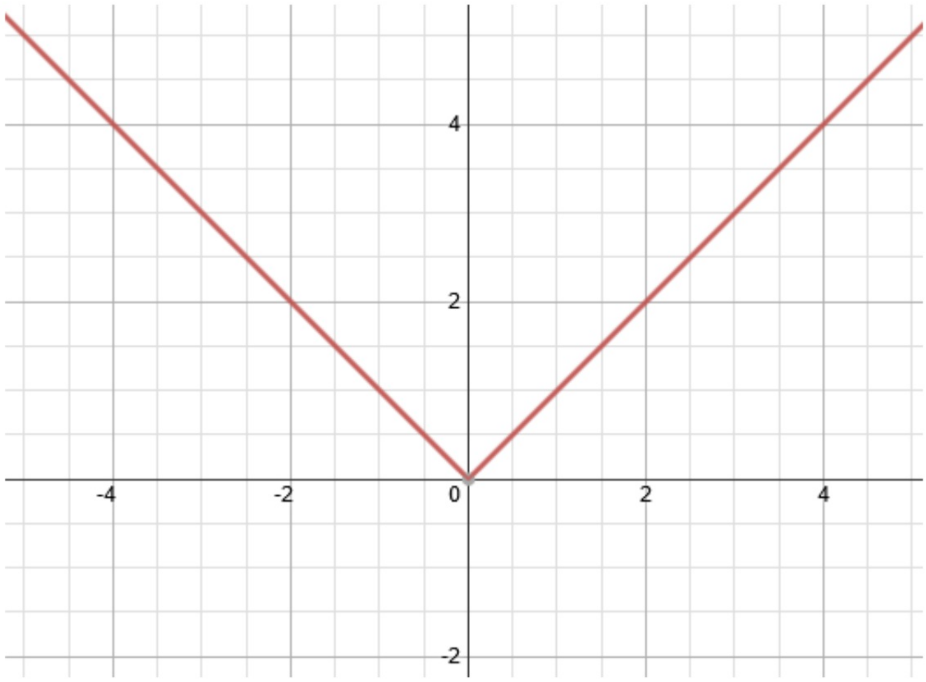
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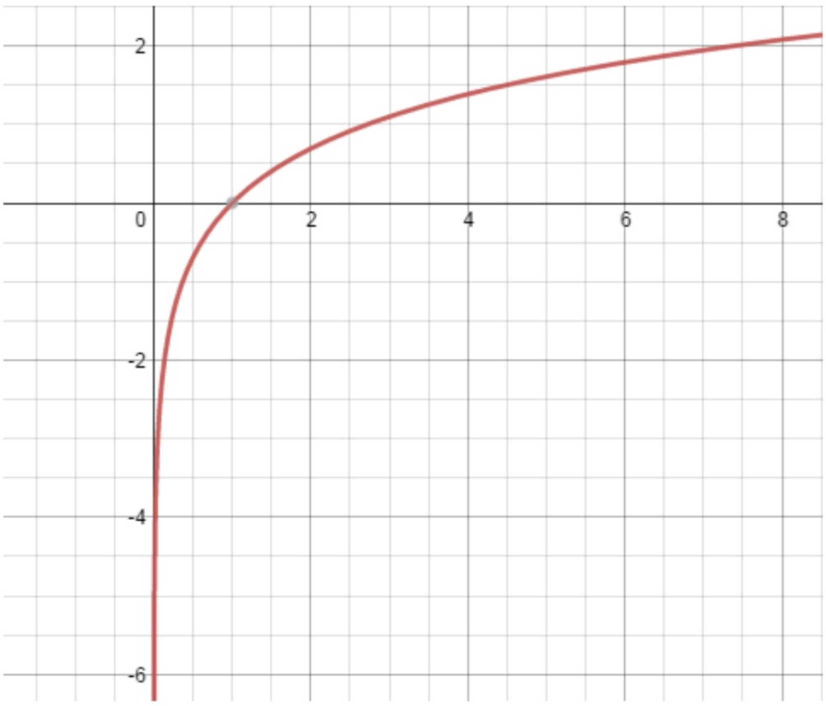
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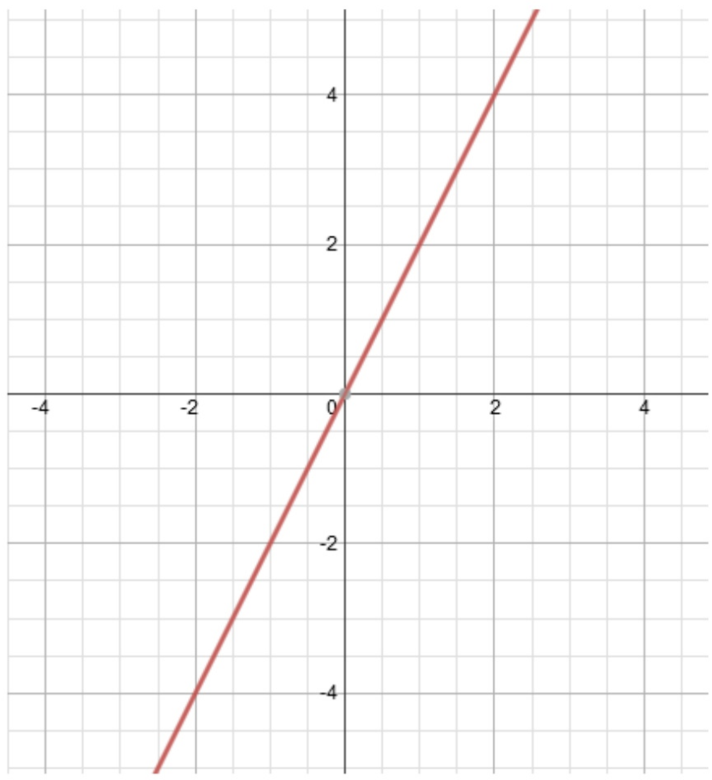

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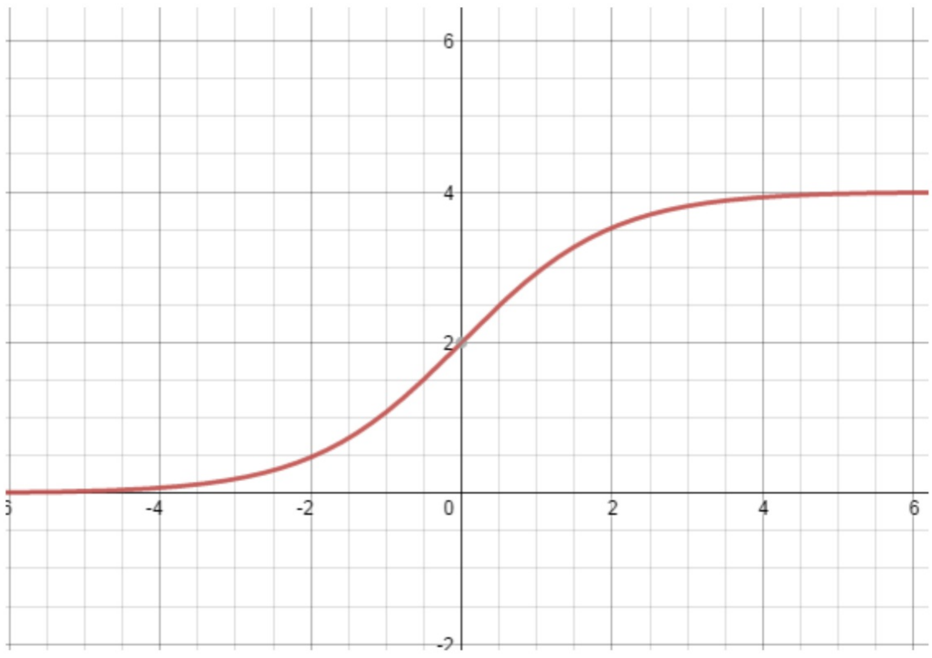

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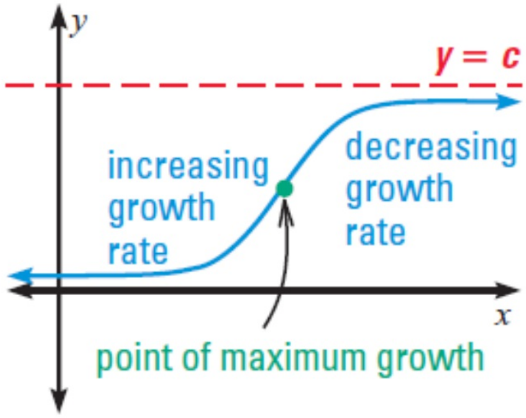
Logistic Growth Functions

In this lesson you will study a family of functions of the form

$$y = \frac{c}{1 + ae^{-rx}}$$

where a, c, and r are all positive constants. Functions of this form are called **logistic growth functions**.



GRAPHS OF LOGISTIC GROWTH FUNCTIONS

The graph of $y = \frac{c}{1 + ae^{-rx}}$ has the following characteristics:

- The horizontal lines $y = 0$ and $y = c$ are asymptotes.
- The y-intercept is $\frac{c}{1 + a}$.
- The domain is all real numbers, and the range is $0 < y < c$.
- The graph is increasing from left to right. To the left of its point of maximum growth, $\left(\frac{\ln a}{r}, \frac{c}{2}\right)$, the rate of increase is increasing. To the right of its point of maximum growth, the rate of increase is decreasing.

9 The maximum height, in inches, a ball reaches after its first four bounces is shown in the table below.

Bounce Number	**Height** (in inches)
1	42.0
2	31.5
3	23.6
4	17.7

Which type of function ***best*** models the data and why?

A an exponential function, because the height of the ball is decreasing by 25% with each bounce

B an exponential function, because the height of the ball is decreasing by 75% with each bounce

C a logistic function, because the height of the ball is decreasing by 25% with each bounce

D a logistic function, because the height of the ball is decreasing by 75% with each bounce

Transformations of the graphs of functions	
$f(x)+c$	shift $f(x)$ up c units
$f(x)-c$	shift $f(x)$ down c units
$f(x+c)$	shift $f(x)$ left c units
$f(x-c)$	shift $f(x)$ right c units
$f(-x)$	reflect $f(x)$ about the y-axis
$-f(x)$	reflect $f(x)$ about the x-axis
$cf(x)$	When $0<c<1$ – vertical shrinking of $f(x)$ When $c>1$ – vertical stretching of $f(x)$ **Multiply the y values by c**
$f(cx)$	When $0<c<1$ – horizontal stretching of $f(x)$ When $c>1$ – horizontal shrinking of $f(x)$ **Divide the x values by c**

1 What transformations have occurred to create the function $f(x) = 3x^3 - 4$ from the function $g(x) = x^3$?

A The graph of the function has been stretched horizontally and shifted up four units.

B The graph of the function has been stretched vertically and shifted up four units.

C The graph of the function has been stretched horizontally and shifted down four units.

D The graph of the function has been stretched vertically and shifted down four units.

D $3(x^3)-4$

3 What is the range of the function $f(x) = {}^-5 - 2(x + 3)^2$?

A $[^-5, \infty)$

B $(^-\infty, 5]$

C $(^-\infty, {}^-5]$

D $(^-\infty, \infty)$

C

14. Match the transformations that would create the graph of $g(x)$ from the graph of $f(x)$.

B	$g(x) = 3f(x)$	**A**	Stretch the graph of $f(x)$ horizontally
C	$g(x) = f(3x)$	**B**	Stretch the graph of $f(x)$ vertically
A	$g(x) = f\left(\frac{1}{3}x\right)$	**C**	Shrink the graph of $f(x)$ horizontally
D	$g(x) = \frac{1}{3}f(x)$	**D**	Shrink the graph of $f(x)$ vertically

For items 5 and 6, solve the equations. Check for any extraneous solutions.

5. $\dfrac{3x}{x-1} = \dfrac{12}{x^2-1} + 2$

6. $\dfrac{x}{x-2} + \dfrac{3x}{x-4} = \dfrac{32-2x}{x^2-6x+8}$

5. $x = -5,\ x = 2$

6. $x = -2$ (-4 is extraneous)

1 Which of the following is equivalent to $\log_5\left(\frac{5}{x^3}\right)$?

A $5-3\log_5 x$

B $1-3\log_5 x$

C $-3\log_5 x$

D $2\log_5 x$

#2 & 3 Solve log equations

$$\log_7(3x-1)=2$$

$$\log_5 x+\log_5(x-4)=1$$

4) A colony of insects has an initial population of 600. The number of insects triples every 4 weeks.

a. Write a function for the number of insects $N(t)$ after t weeks.

b. What will the number of insects (nearest whole number) be after 7 weeks?

c. About how many weeks (correct to three decimal places) will the number of insects be 12,000?