Trig 3.5

Determine whether a function is continuous
Identity end behavior of a function
Determine whether a function is increasing or decreasing on an interval

continuous traceable

discontinous

end behavior *(algebra 2)*

increasing } related to slope

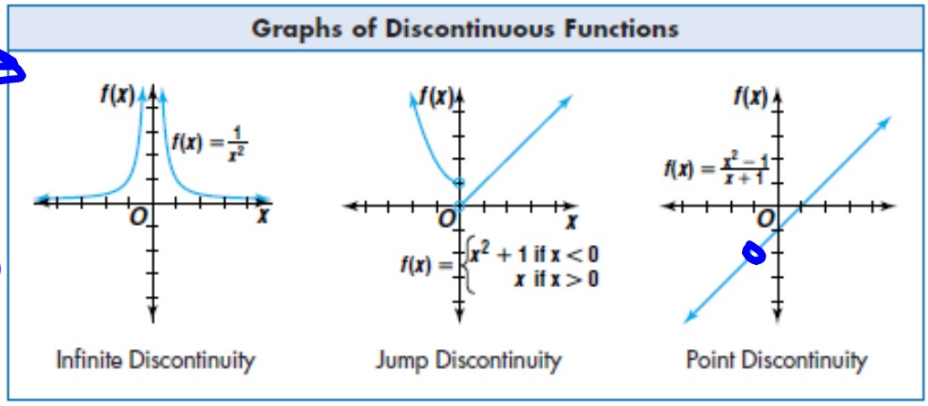
decreasing }

interval

infinite discontinuity

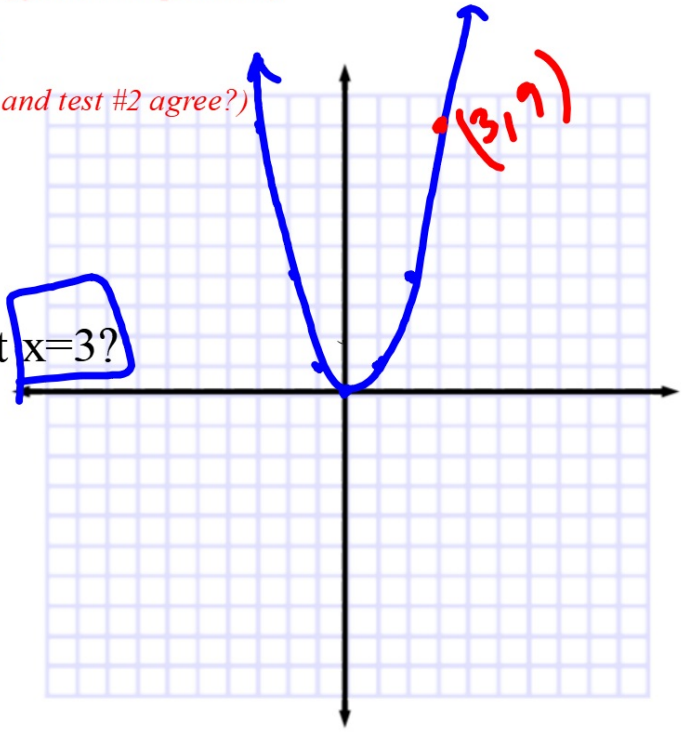
jump discontinuity

point discontinuity



Continuity test: Is the graph continuous at c?

1. What function? *(Can I find f(c) from the equation?)*
2. Where? *(Look at the graph)*
3. Do they match? *(Do test #1 and test #2 agree?)*



Ex. $f(x) = x^2$

Is the function continuous at x=3?

$f(x) = x^2$

1. $f(3) = 9$

1 Determine whether each function is continuous at the given x-value.

a. $f(x) = 3x^2 + 7; x = 1$

1. $f(1) = 10$

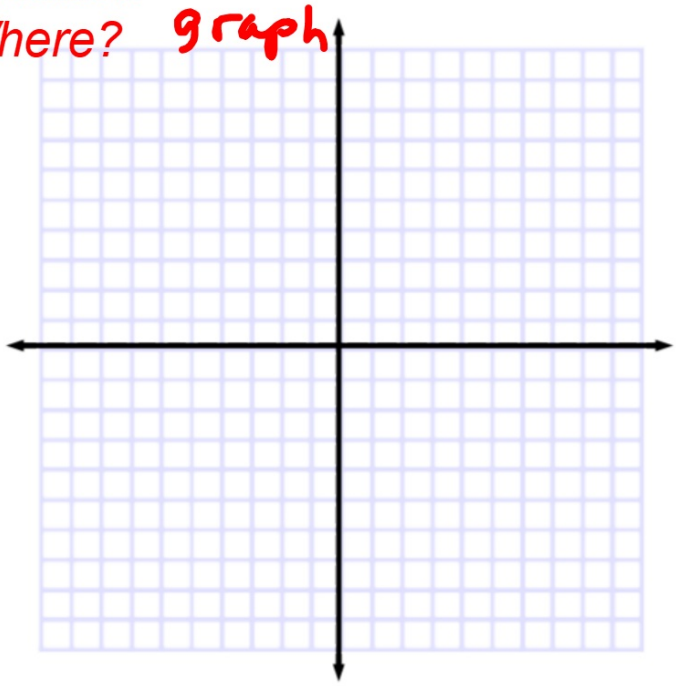
What function? $f(x)$
Where? graph

1. What function?
2. Where?
3. Do they match?

10

(1, 10)

yes



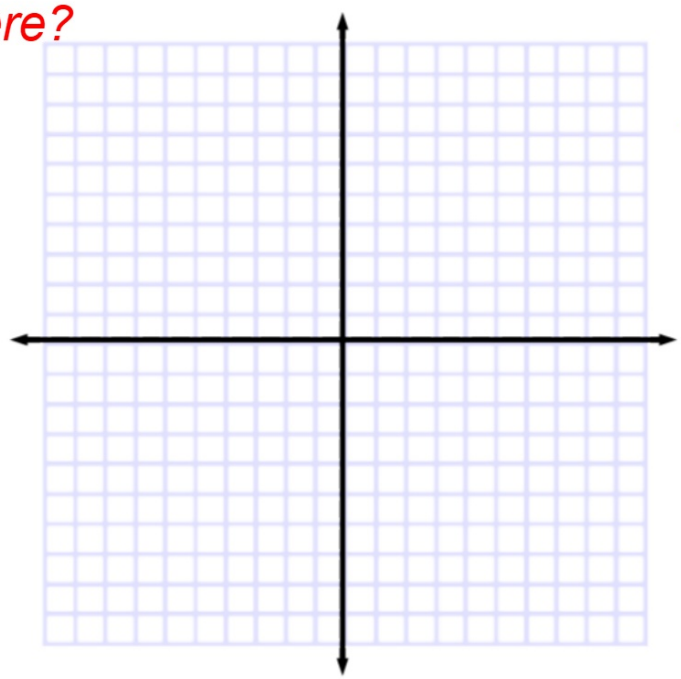
$\frac{1}{5}$

b. $f(x) = \frac{x-2}{x^2-4}; x = 2$

What function? Where?

$f'(2) = \frac{2-2}{4-4} = \frac{0}{0}$

1. What function?
2. Where?
3. Do they match?



Piecewise function (alg 2)

c. $f(x) = \begin{cases} \frac{1}{x} & \text{if } x > 1 \\ x & \text{if } x \leq 1 \end{cases}$

$y = \frac{1}{x}$ $x > 1$

$x = 1$

$y = x$

x	y
0	0
1	1
-1	-1

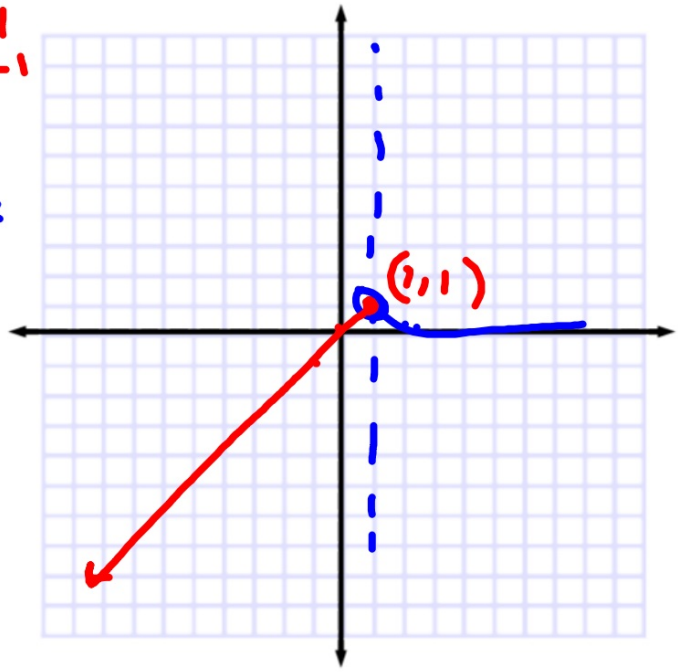
x	$y = \frac{1}{x}$
0	undefined
1	1
2	$\frac{1}{2}$
4	$\frac{1}{4}$

What function? Where?

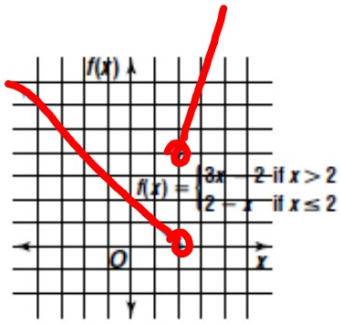
$f(x) = x$

$f(1) = 1$

yes

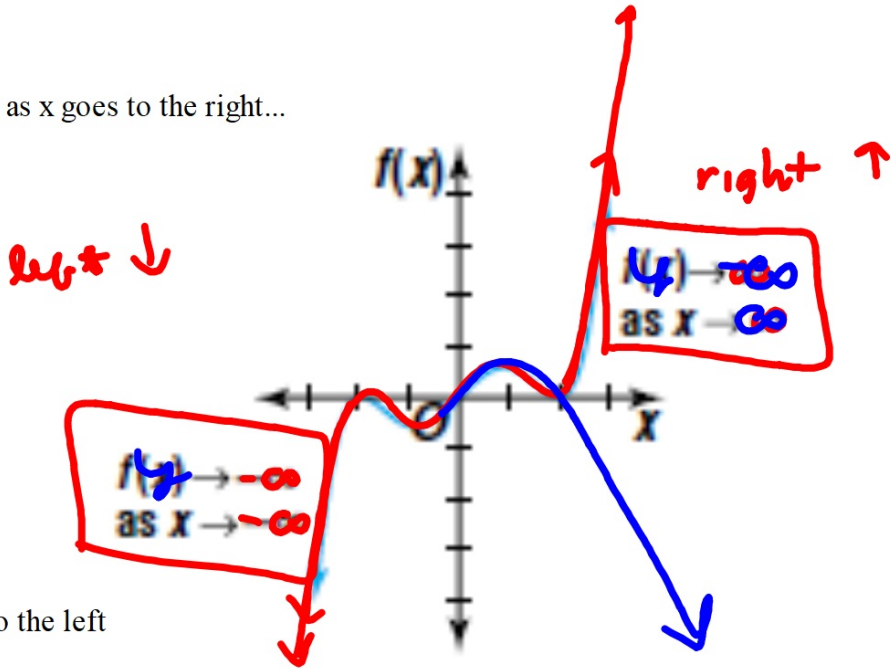


Continuity on an Interval	A function $f(x)$ is continuous on an interval if and only if it is continuous at each number x in the interval.



Doesn't have to be continuous everywhere. Where are they asking about?

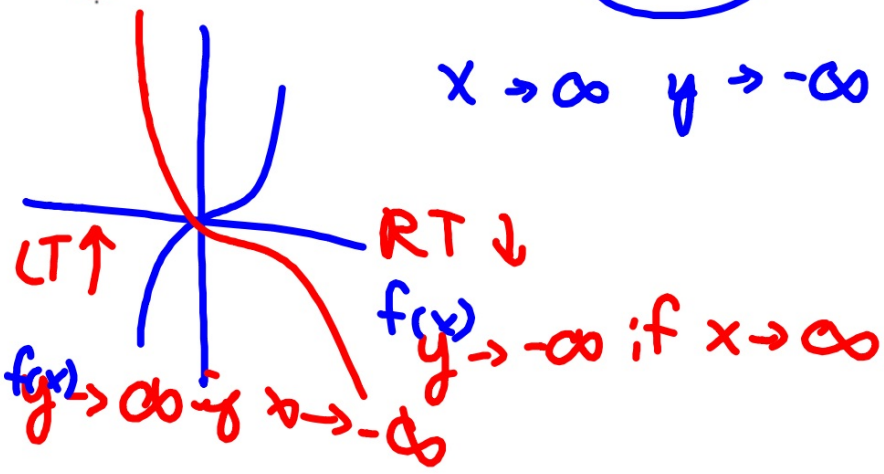
End behavior:
The function goes up as x goes to the right...
Words...code...



The function goes down as x goes to the left

y x

3 Describe the end behavior of $f(x) = -2x^3$ and $g(x) = -x^3 + x^2 - x + 5$.



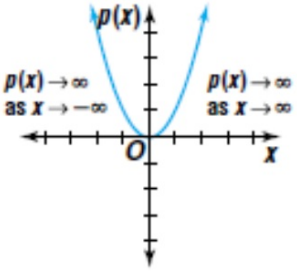
What is the code?
f(x) does what? *up or down*
when (x) does what? *left or right*

End Behavior of Polynomial Functions

$p(x) = a_n x^n + a_{n-1}x^{n-1} + a_{n-2}x^{n-2} + \ldots + a_2 x^2 + a_1 x + a_0,\ n > 0$

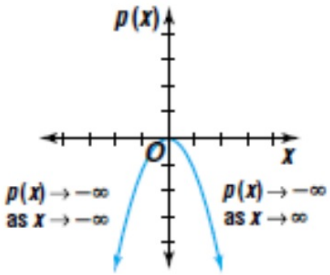
a_n: positive, n: even

$p(x) = x^2$



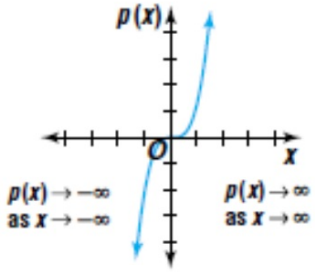
a_n: negative, n: even

$p(x) = -x^2$



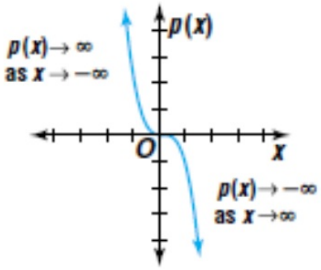
a_n: positive, n: odd

$p(x) = x^3$

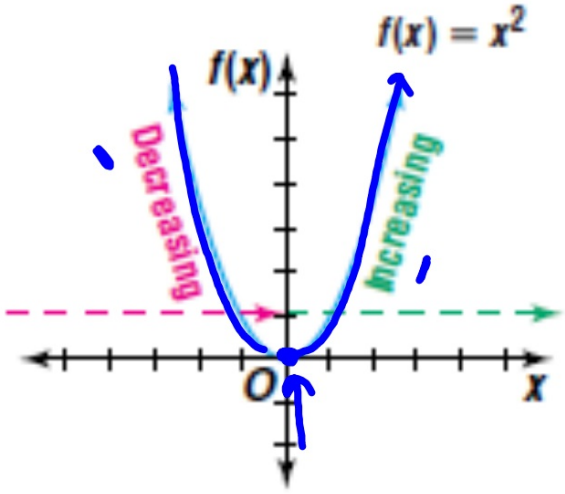


a_n: negative, n: odd

$p(x) = -x^3$



related to slope *(but not exactly...)*



Slope is not constant: that would be linear.
Changing but still negative slope ...zero... changing but still positive slope

Use interval notation *(here's the code)*

4 **Graph each function. Determine the interval(s) on which the function is increasing and the interval(s) on which the function is decreasing.**

interval notation

$f(x) = |x| + 2$

$-\infty \rightarrow x = 0$ $\quad$ $x = 0 \rightarrow \infty$

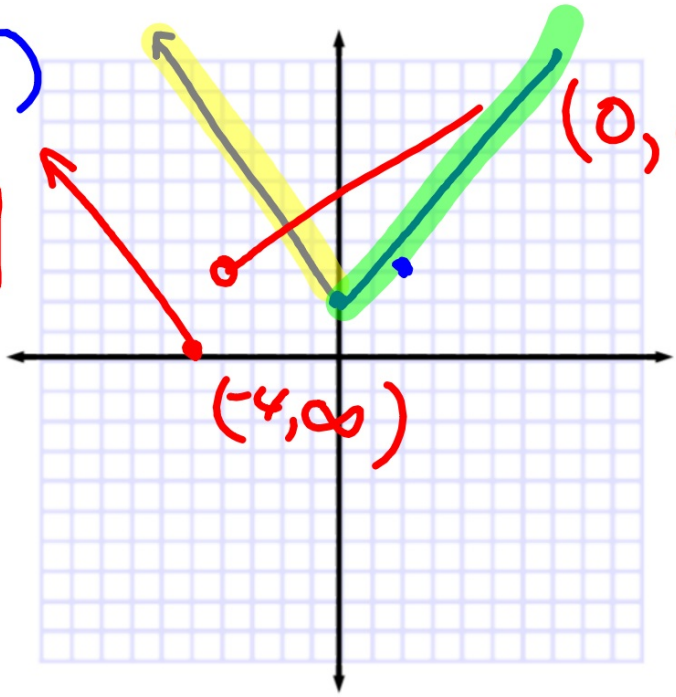
[closed]
(open)

$(-\infty, 0)$ $\quad$ $(0, \infty)$

$(-\infty, -5]$

$]$?

$(-4, \infty)$



Graphing Calculator Tip

By watching the *x*- and *y*-values while using the **TRACE** function, you can determine approximately where a function changes from increasing to decreasing and vice versa.

p. 166 13-31 odd

4 **Graph each function. Determine the interval(s) on which the function is increasing and the interval(s) on which the function is decreasing.**

a. $f(x) = 3 - (x - 5)^2$