WARMUP

$\sqrt[3]{\frac{1}{64}}$ = (1/64)^(1/3)

Find the equation for each of the functions.

1) Linear through (-3,7) and (1,-2)

$m = \frac{-2-7}{1-(-3)} = \frac{-9}{4}$

$7 = -\frac{9}{4}\cdot(-3) + b$

$7 = \frac{27}{4} + b$

$\frac{28}{4} - \frac{27}{4} = \frac{1}{4} = b$

$\boxed{y = -\frac{9}{4}x + \frac{1}{4}}$

b) Exponential through $(-1, \frac{1}{12})$ and $(2, 18)$

$y = a\cdot b^x$

$\frac{1}{12} = \cancel{a}\cdot b^{-1}$

$\div \quad 18 = \cancel{a}\cdot b^2$

$\frac{1}{216} = b^{-3}$

$\frac{1}{216} = \frac{1}{b^3}$

$\frac{1}{12} \div 18$

$\frac{1}{12}\cdot\frac{1}{18} = \frac{1}{216}$

$b^3 = 216$

$b = 6$

216^(1/3)

$y = a\cdot 6^x$

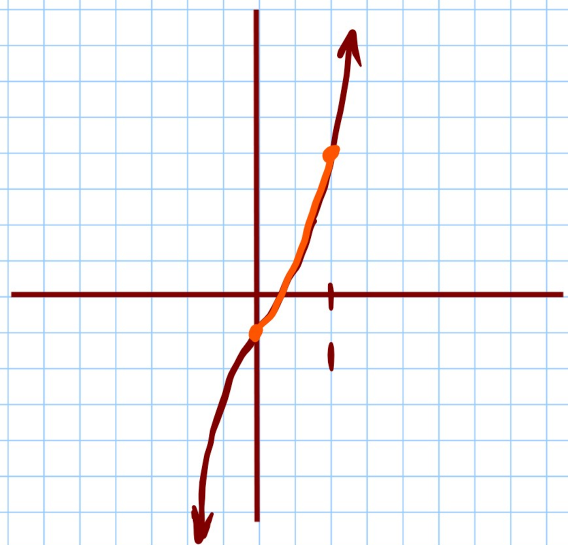
$18 = a\cdot 6^2$

$\frac{18}{36} = \frac{1}{2} = a$

$\boxed{y = \frac{1}{2}\cdot 6^x}$

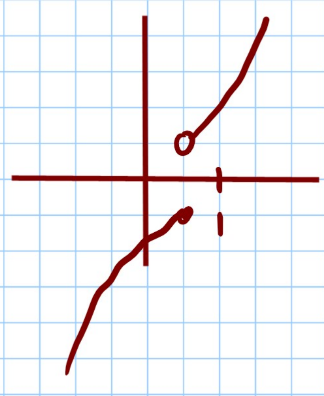
Section 1.7 Continuity

A graph is <u>continuous</u> on an interval if it has no breaks (asymptotes), jumps, or holes on that interval.

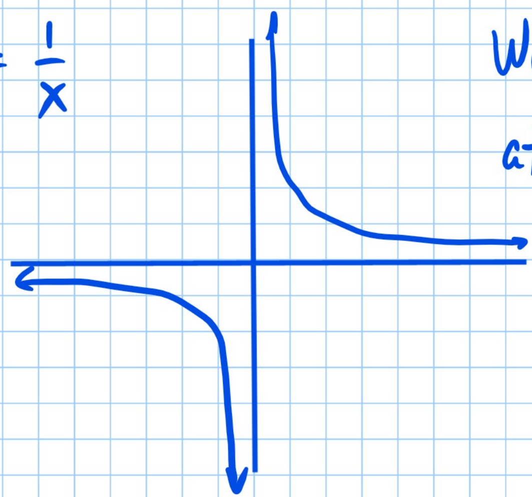


$f(x) = 3x^3 - x^2 + 2x - 1$ is continuous everywhere.

Note that this guarantees a zero (x-int) between 0 and 1.



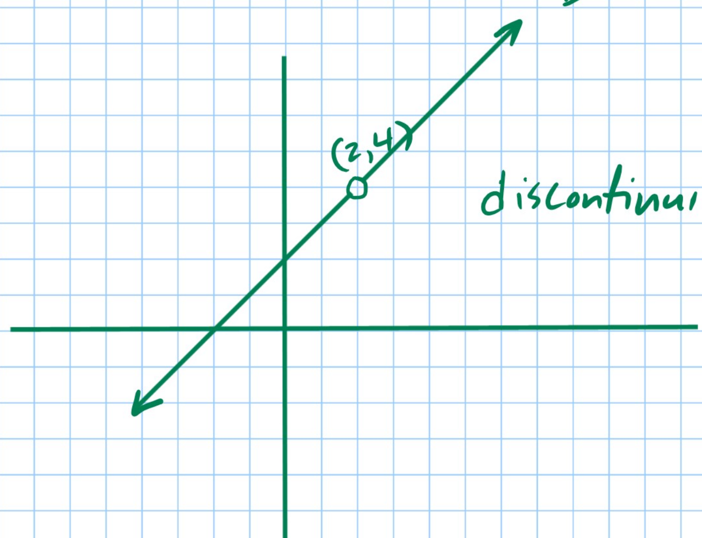
$f(x) = \frac{1}{x}$



We say there's a discontinuity at $x=0$ since there's a vertical asymptote at $x=0$.

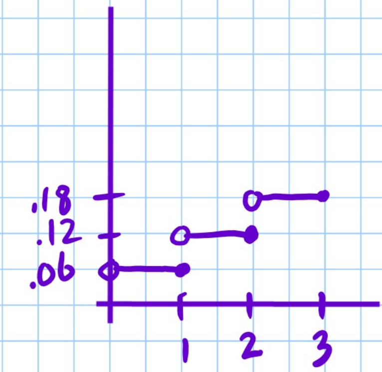
Another example of a discontinuity is when the graph has a hole

$$f(x) = \frac{x^2-4}{x-2} = \frac{(x+2)\cancel{(x-2)}}{\cancel{x-2}} = x+2 \quad , x \neq 2$$



discontinuity when $x=2$

Step functions have many discontinuities which are jumps



Some functions are continuous for all real number

- linear, polynomial, exponential, sine, and cosine

The function $y = \log x$ is continuous for $x > 0$

A rational function like $f(x) = \frac{x^3 - 27}{x+4}$ is continuous except where denominator $= 0$. So this function is continuous except when $x = -4$.

ex: Is $f(x) = 2x + x^{-1}$ continuous on $[-1, 1]$?

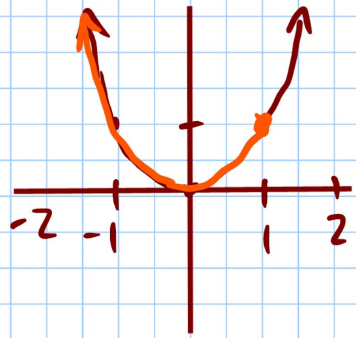
$$f(x) = 2x + \frac{1}{x} \Rightarrow x \neq 0$$

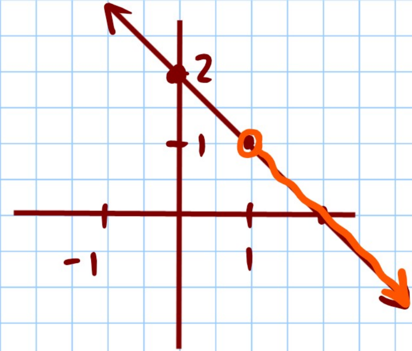
No since 0 is in $[-1, 1]$

ex: Graph $f(x) = \begin{cases} x^2, & x \leq 1 \\ 2-x, & x > 1 \end{cases}$ "piecewise defined"

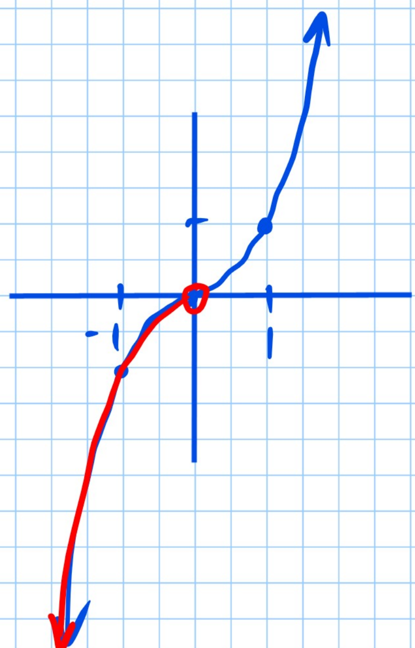
continuous everywhere

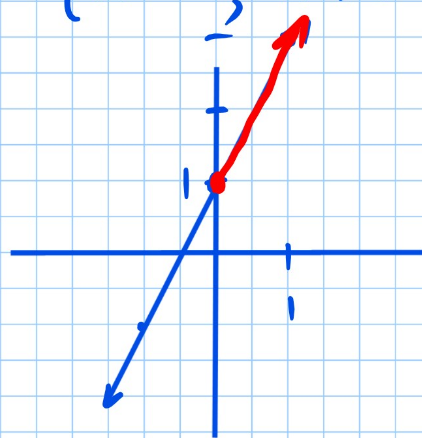
↓



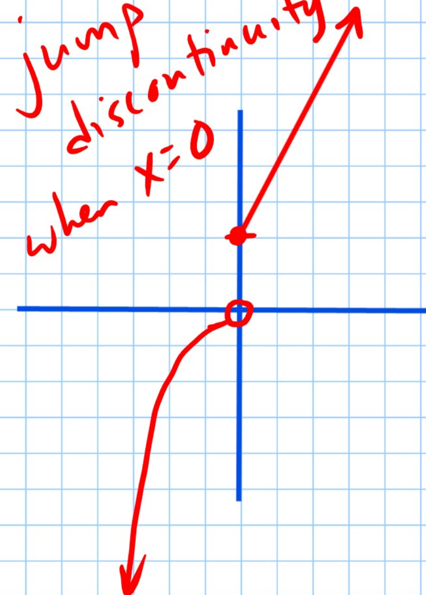


ex: Graph $f(x) = \begin{cases} x^3, & x < 0 \\ 2x+1, & x \geq 0 \end{cases}$





jump discontinuity when $x=0$



ex: Find k so that $f(x) = \begin{cases} kx^2, & x < -1 \\ -x+2, & x \geq -1 \end{cases}$

is continuous everywhere

2 graphs must meet when $x=-1$

$kx^2 = -x + 2$ when $x = -1$

$k(-1)^2 = -(-1) + 2$

$k = 1+2$

$k = 3$

p47-48
2-6, 13-15