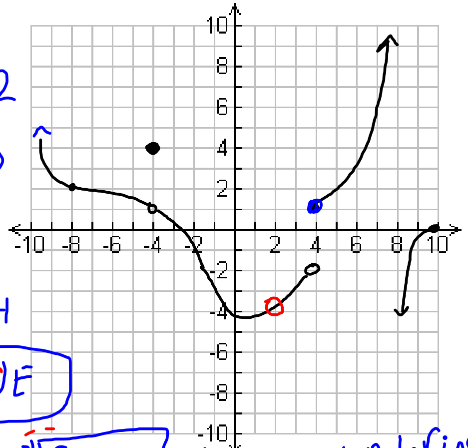
Good afternoon Happy Monday!

Agenda:
-Return Quizzes → Have HW out
- Remind Code:19calc20
-Delta Math: 196729

-You need to have your AP College board login ready on Wednesday.

-Continue Limits

Pre-Calc Quiz
Return
Find the limits




a) $\lim_{x \to -8} f(x) = 2$

b) $\lim_{x \to -4} f(x) = 1$

c) $f(-4) = 4$

d) $\lim_{x \to 2} f(x) = \sim -4$

e) $\lim_{x \to 4} f(x) = \text{DNE}$

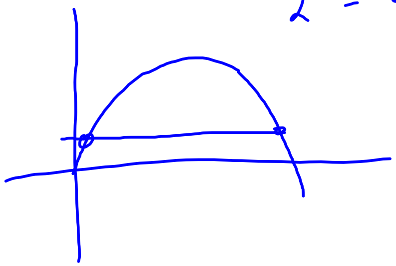
f) $\lim_{x \to 8} f(x) = \text{DNE}$

g) $\boxed{f(4) = 1}$

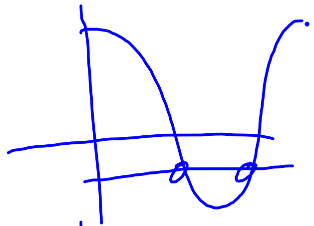
h) $f(8) = \text{undefinel}$

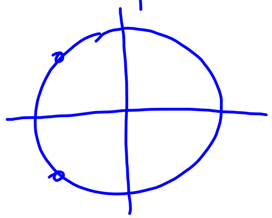
$$e^{\frac{1}{2}\ln 2} = e^{(\ln 2)^{\frac{1}{2}}}$$

$$2^{\frac{1}{2}} = \sqrt{2}$$



$$\cos^{-1}\left(-\frac{\sqrt{2}}{2}\right)$$





$$\frac{\cot^2 x \cdot \cos^2 x}{\cot^2 x - \cos^2 x}$$

$$\frac{\frac{\cos^2 x}{\sin^2 x} \cdot \cos^2 x}{\frac{\cos^2 x}{\sin^2 x} - (\cos^2 x)\frac{\sin^2 x}{\sin^2 x}} = \frac{\frac{\cos^4 x}{\cancel{\sin^2 x}}}{\frac{\cos^2 x - \cos^2 x \sin^2 x}{\cancel{\sin^2}}}$$

$$\frac{\cos^4 x}{\cos^2(1-\sin^2 x)} = \frac{\cos^4 x}{\cos^4 x}$$

$= 1$

9 $\tan^2 x - 1 = 0$

$\sin x - 1 = 0$

$\sin x = 1$

$\frac{\pi}{2}$

$\tan^2 x = 1$

$\tan x = \pm 1$

$\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

$\sqrt{x^2 - 3 + 2}$

$\sqrt{x^2 - 1}$

$\sqrt{(x+1)(x-1)}$

10 $\sqrt{\sqrt{x+2} + 2}$

11

| H.A. | V.A | Hole |
|---|---|---|
| $y = \frac{1}{2}$ | $x = \frac{1}{2}$ | $x = -1$ |

$$\frac{\cancel{(x+1)}(x-1)}{(2x-1)\cancel{(x+1)}}$$

$2^4 = (2^3)^{3x}$

$2^4 = 2^{9x}$

$\frac{4}{9} = x$

$(2x+3)(3x-1)$

$x = \frac{-3}{2}$ $x = \frac{1}{3}$

Title: Sep 9-1:24 PM (3 of 15)

$$x = \frac{\ln(y-5)^3}{3}$$

$$3x = \ln(y-5)^3$$

$$3x = 3\ln(y-5)$$

$$e^{x} = \cancel{e}^{\ln(y-5)}$$

$$e^x = y-5$$

$$e^x + 5 = y$$

$$\sqrt[3]{3x} = \cancel{\ln}(y-5)$$

$$\frac{e \qquad \cancel{e}}{\left(e^{3x}\right)^{\frac{1}{3}} = y-5}$$

$$\boxed{e^x + 5 = y}$$

$$\frac{\cot^2(x)\cos^2(x)}{\cot^2(x)\cdot\cos^2(x)\cdot\frac{\sin^2(x)}{\sin^2(x)}}$$

$$\frac{\cos^2(x)}{\sin^2(x)}\cdot\cos^2(x) = \frac{\cos^4(x)}{\cancel{\sin^2(x)}}$$

$$\frac{\cos^2 x}{\sin^2 x} - \frac{\cos^2 x\sin^2 x}{\sin^2 x} \qquad \frac{\cos^2 x\,(1-\sin^2(x))}{\cancel{\sin^2 x}} = 1$$

$\tan^2 x - 1 = 0$

$\tan^2 x = 1$

$\tan x = \pm 1$

$\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

$\sin x - 1 = 0$

$\sin x = 1$

$\pi/2$

$\cancel{x} = 0$

$\sqrt{x^2 - 3 + 2}$

ⓐ $\sqrt{\sqrt{x+2} + 2}$

ⓑ $\sqrt{x^2 - 1}$

$\sqrt{(x+1)(x-1)}$

HA
$y = \frac{1}{2}$

UA
$x = \frac{1}{2}$

$\frac{(x+1)(x-1)}{(2x-1)(x+1)}$

$2^4 = (2^3)^{3x}$

$2^4 = 2^{9x}$

$x = 4/9$

$(2x+3)(3x-1)$

$x = \frac{-3}{2}$ $x = \frac{1}{3}$

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$x = \frac{\ln(y-5)^3}{3}$

$3x = \ln(y-5)^3$

$3x = 3\ln(y-5)$

$x = \ln(y-5$

$e^x = y - 5$

$e^x + 5 = y$

$e^{\sqrt[3]{3x}} = e^{\ln(y-5)}$

$e^{(3x)^{1/3}} = y - 5$

$e^x + 5 = y$

Limits:

1) Why do you think limits for piece wise function are commonly taken as x approaches the break?

$$f(x) = \begin{cases} x^2 - 3 & x < 0 \\ x + 3 & x \geq 0 \end{cases}$$

$$\lim_{x \to 0} f(x)$$

Limits that fail to exist

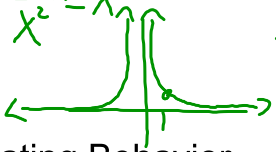
i. Different left and right behavior

$$\lim_{x \to 0} \frac{|x|}{x} \qquad |x| = \begin{cases} x, & x > 0 \\ x, & x < 0 \end{cases}$$

$$\boxed{DNE} \qquad \frac{|x|}{x} = \begin{cases} 1, & x > 0 \\ -1, & x < 0 \end{cases}$$

ii. Unbounded Behavior

$$f(x) = \frac{1}{x^2} = x^{-2} \qquad \lim_{x \to 0} \frac{1}{x^2} \qquad DNE$$



iii. Oscillating Behavior

$$f(x) = \sin\left(\frac{1}{x}\right) \qquad DNE$$

$$\lim_{x \to 0} \sin\left(\frac{1}{x}\right)$$

$\lim_{x \to c} f(x) = f(c)$ Continuous @ c

Thm 1.1 1.2

Let b and c be real numbers, and let n be a positive integer. (let f and g be functions with limits; $\lim_{x \to c} f(x) = L$ and $\lim_{x \to c} g(x) = K$.)

Th1.1

$\lim_{x \to c} b = b$ $\lim_{x \to c} x = c$

$\lim_{x \to c} x^n = c^n$ (Direct substitution)

1.2

Scalar multiple $\lim_{x \to c} b \cdot f(x) = b \lim_{x \to c} f(x) = \boxed{b \cdot L}$

sum or difference $\lim_{x \to c} [f(x) \pm g(x)] = \lim_{x \to c} f(x) \pm \lim_{x \to c} g(x)$

$= L \pm K$

Product $\lim_{x \to c} (f(x) \cdot g(x))$

$\lim_{x \to c} f(x) \cdot \lim_{x \to c} g(x) = L \cdot K$

Quotient $\lim_{x \to c} \frac{f(x)}{g(x)} = \frac{\lim_{x \to c} f(x)}{\lim_{x \to c} g(x)} = \frac{L}{K}$ $K \neq 0$

Power $\lim_{x \to c} [f(x)]^n = \left[\lim_{x \to c} f(x)\right]^n$

$L^n$

$$\lim_{x\to c} f(x) = f(c)$$

Continuous $y=x$, $y=x^2$

polynoimal

$3x^2+7x+2$

Thm 1.1

Let b and c be a real number and let n be a positive integer

$f(x)=x$

$$\lim_{x\to c} b = b \qquad \lim_{x\to c} x = c$$

$$\lim_{x\to c} x^n = c^n$$

EX $\lim_{x\to 2} 3 = 3$ $\quad \lim_{x\to -4} x = -4$

$$\lim_{x\to 2} x^4 = 2^4 = 16$$

① Scalar $\lim_{x\to c} b\cdot f(x) = b\cdot L$

$b \lim_{x\to c} f(x)$

② Sum or difference $\lim_{x\to c} [f(x) \pm g(x)]$

$\lim_{x\to c} f(x) \pm \lim_{x\to c} g(x)$

$= L \pm K$

③ Product

$$\lim_{x\to c} \left(f(x)\cdot g(x)\right) = \lim_{x\to c} f(x) \cdot \lim_{x\to c} g(x)$$

$= L\cdot K$

Title: Sep 9-12:28 PM (12 of 15)

④ Quotient

$$\lim_{x\to c} \frac{f(x)}{g(x)} = \frac{\lim_{x\to c} f(x)}{\lim_{x\to c} g(x)}$$

$$= \frac{L}{K} \quad K \neq 0$$

Power

$$\lim_{x\to c} [f(x)]^n = \left[\lim_{x\to c} f(x)\right]^n$$

$$= L^n$$

$$\lim_{x\to 2} 4x^2+3 = \lim_{x\to 2} 4x^2 + \lim_{x\to 2} 3$$

Direct

$4(2)^2+3$

19

$$4 \lim_{x\to 2} x^2 + \lim_{x\to 2} 3.$$

$$4(4) + 3$$

$$16 + 3 = 19$$

1.3 Ex

$$\lim_{x\to 1} \frac{x^2+x+2}{x+1} = \frac{\lim_{x\to 1} x^2+x+2}{\lim_{x\to 1} x+1}$$

$(x \neq -1)$

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

$\sqrt{x}$ , $x \geq 0$

# Limits Properties and Analytically.