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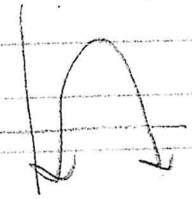
7) Consider $f(x) = 6x - x^2$ and the point $(2,8)$

a) Fill in the values for $f(x)$

x	$f(x)$
3	9
2.5	9.75
1.5	6.75



b) Find the slope of the secant line $(x, f(x))$ and $(2, 8)$

$\frac{9-8}{3-2} = 1 \quad \frac{9.75-8}{2.5-2} = \frac{3}{2}$

c) $\frac{f(x)-8}{x-2} = \frac{6x-x^2-8}{x-2} = \frac{-x^2+6x-8}{x-2} = \frac{-(x-4)\cancel{(x-2)}}{\cancel{x-2}}$

$= -x+4$

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2) $\lim_{x\to 2} \frac{x-2}{x^2-4} = \frac{\cancel{x-2}}{(x+2)\cancel{(x-2)}} = \frac{1}{x+2} = \frac{1}{4}$

Use the graph to determine if the limit exists:

16) $\lim_{x\to 1} (x^2+3)$
yes $=4$

18) $\lim_{x\to 1} f(x) = \begin{cases} x^2+3 & x \neq 1 \\ 2 & x = 1 \end{cases}$
yes $=4$

20) $\lim_{x\to 5} \frac{2}{x-5}$
no

22) $\lim_{x\to 0} \sec x$
yes $=1$

24) $\lim_{x\to \pi/2} \tan x$
no

26) a) DNE f) $1/2$
b) DNE g) 2
c) 4 h) ∞
d) DNE
e) DNE

(30) $f(x) = \begin{cases} \sin x & x < 0 \\ 1-\cos x & 0 \le x \le \pi \\ \cos x & x > \pi \end{cases}$

Identify where $\lim_{x \to c} f(x)$ exists

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

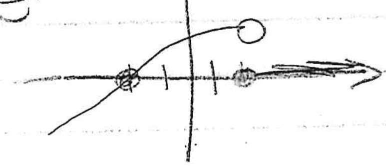
$\lim_{x \to 0^+} f(x) = 0$ $\qquad \lim_{x \to \pi^+} = -1$

$\lim_{x \to 0} = 0$ $\qquad \lim_{x \to \pi}$ DNE

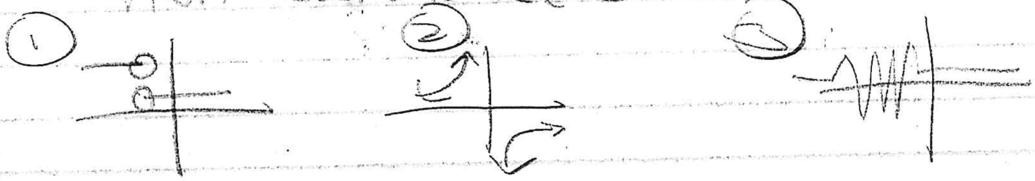
all values except π

(32) Sketch a graph.

$\lim_{x \to 2} f(x)$ DNE, $f(-2) = 0$, $f(2) = 0$, $\lim_{x \to -2} f(x) = 0$



(63) Draw 3 examples of the non-existence of a limit.



(64) a) If $f(2) = 4$, what can you conclude about $\lim_{x \to 2} f(x)$?

Nothing!

b) If $\lim_{x \to 2} f(x) = 4$, what can you conclude about $f(2)$?

Nothing!

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1) $\lim_{x \to -5} \frac{\sqrt{4-x} - 3}{x+5} \cdot \frac{(\sqrt{4-x}+3)}{(\sqrt{4-x}+3)}$

$\frac{4-x-9}{(x+5)(\sqrt{4-x}+3)}$

$\frac{-5-x}{(x+5)(\sqrt{4-x}+3)}$

$\frac{-(\cancel{x+5})}{\cancel{x+5}(\sqrt{4-x}+3)}$

$\frac{-1}{\sqrt{4-x}+3} = \frac{-1}{\sqrt{4+5}+3} = \frac{-1}{6}$

59) $\lim_{x \to 9} \frac{x-9}{\sqrt{x}-3} \cdot \frac{(\sqrt{x}+3)}{(\sqrt{x}+3)}$

$\frac{(\cancel{x-9})(\sqrt{x}+3)}{\cancel{x-9}}$

$\sqrt{x}+3 = \sqrt{9}+3 = 6$

6) $\lim_{x \to 4} \frac{\frac{x}{x+1} - \frac{4}{5}}{x-4}$ $\rightarrow$ $\frac{5x}{5(x+1)} - \frac{4(x+1)}{5(x+1)}$

$\frac{5x-4x-4}{5(x+1)}$

$\frac{x-4}{5(x+1)}$

$\frac{x-4}{5(x+1)} \div x-4$

$\frac{\cancel{x-4}}{5(x+1)} \cdot \frac{1}{\cancel{x-4}}$

$\frac{1}{5(x+1)} = \frac{1}{5(4+1)} = \frac{1}{25}$

OR: $\frac{x-9}{\sqrt{x}-3}$

$\frac{(\sqrt{x}+3)(\cancel{\sqrt{x}-3})}{\cancel{\sqrt{x}-3}}$

$\sqrt{x}+3 = \sqrt{9}+3 = 6$

$x \to -5 \quad x+5 \quad (\sqrt{4} \ldots$

$$\frac{4-x-9}{(x+5)(\sqrt{4-x}+3)}$$

$$\frac{-5-x}{(x+5)(\sqrt{4-x}+3)}$$

$$\frac{-(\cancel{x+5})}{\cancel{x+5}(\sqrt{4-x}+3)}$$

$$\frac{-1}{\sqrt{4-x}+3} = \frac{-1}{\sqrt{4+5}+3} = \frac{-1}{6}$$

59 $\lim\limits_{x \to 9} \frac{x-9}{\sqrt{x}-3} \frac{(\sqrt{x}+3)}{(\sqrt{x}+3)}$

$$\frac{(\cancel{x-9})(\sqrt{x}+3)}{\cancel{x-9}}$$

$$\sqrt{x}+3 = \sqrt{9}+3 = 6$$

6 $\lim\limits_{x \to 4} \frac{\frac{x}{x+1} - \frac{4}{5}}{x-4} \longrightarrow \frac{5x}{5(x+1)} - \frac{4(x+1)}{5(x+1)}$

$$\frac{5x-4x-4}{5(x+1)}$$

$$\frac{x-4}{5(x+1)}$$

$$\frac{x-4}{5(x+1)} \div x-4$$

$$\frac{\cancel{x-4}}{5(x+1)} \cdot \frac{1}{\cancel{x-4}}$$

$$\frac{1}{5(x+1)} = \frac{1}{5(4+1)} = \frac{1}{25}$$

OR: $\frac{x-9}{\sqrt{x}-3}$

$$\frac{(\sqrt{x}+3)(\cancel{\sqrt{x}-3})}{\cancel{\sqrt{x}-3}}$$