a. $\lim_{x\to 3^-} f(x) = 4$

b. $\lim_{x\to 3^+} f(x) = -1$

c. $\lim_{x\to -1} f(x) = 0$

d. $\lim_{x\to 0} f(x) = -2$

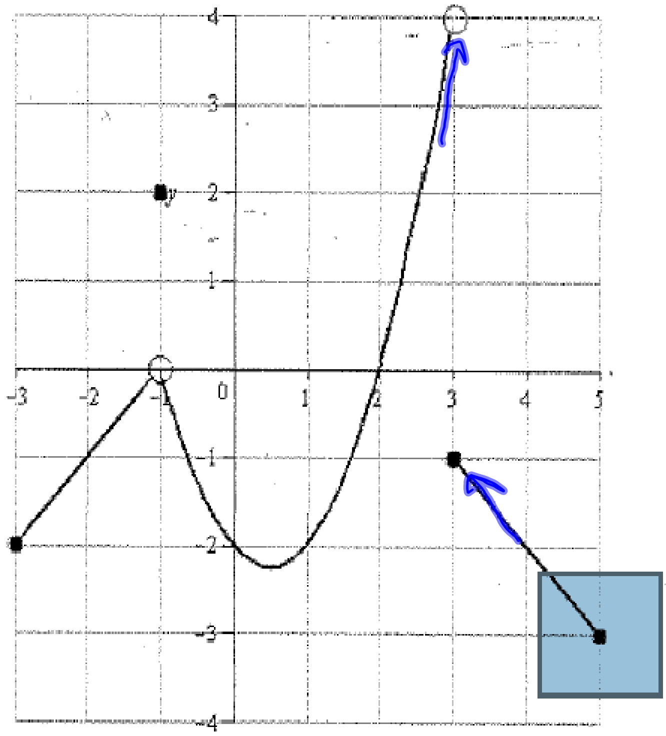
e. Where is f continuous?

Typo!

$,-1) \cup (-1,3) \cup (3,5]$

f. Where does f only have a left-hand limit?

@ $x=5$



At the edge of the domain, one-sided limits are all you have.

$$\{x \mid -3 \le x \le 5 \text{ and } x \ne -1 \text{ and } x \ne 3\}$$

$$= [-3,5] \setminus \{-1,3\}$$

$$\lim_{x\to 3} f(x) = f(3)$$

① The limit $\exists$

② The limit agrees with the function at the limiting value.

3.3 Due Friday

Find where the slope of the curve is 7.

$\sin^2\theta - 3\sin\theta - 4 = 0$

$(\sin\theta - 4)(\sin\theta + 1) = 0$

Set $f'(x) = 7$ & solve

.... horizontal :

$\boxed{\text{Set } f'(x) = 0 \text{ \& solve}}$

Minimize Slope :

Minimize $f'(x)$

3.3 #44

#43 done yesterday

(a) Eq'n of line
$\perp$ to x^3-4x+1 @ $(2,1)$

$f'(x)=3x^2-4$

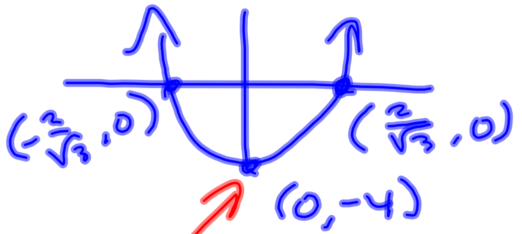
$f'(2)=3(2)^2-4$

$= 8$, so $m_\perp$ is $-\frac{1}{8}$

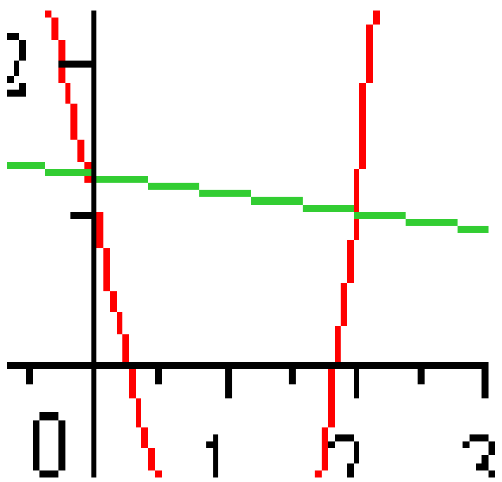
$y=-\frac{1}{8}(x-2)+1$ is $\perp$ to
$f(x)$ @ $(2,1)$

(b) Smallest Slope is @ what point & what is it.

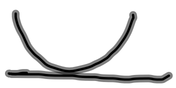
$f'(x)=3x^2-4$ to be minimized.



Minimum of SLOPE function, $f'(x)$



$f'(x) = 3x^2 - 4$ is minimized at the vertex.



slope is zero there.

So to find min slope,
take $f''(x) \overset{SET}{=} 0$

$(3x^2-4)' = 6x \overset{SET}{=} 0 \Longrightarrow$

$x = 0$ is where min slope occurs.

§3.3 #58 To be dif'b'l you need

$\boxed{① \text{ cnt's } \lim_{x \to -1} f(x) = f(-1)}$

② dif'b'l $\lim_{h \to 0} \frac{f(-1+h) - f(-1)}{h}$

This boils down to

Then Do this

$$\lim_{x \to -1^-} f'(x) = \lim_{x \to -1^+} f'(x)$$

$$\frac{d}{dx}\left[bx^2 - 3\right]\Big|_{x=-1} = \frac{d}{dx}\left[ax+b\right]\Big|_{x=-1}$$

$$2bx = a$$

$-2b = a = 3$

$\boxed{b = -\frac{3}{2}}$

1st Do THIS

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

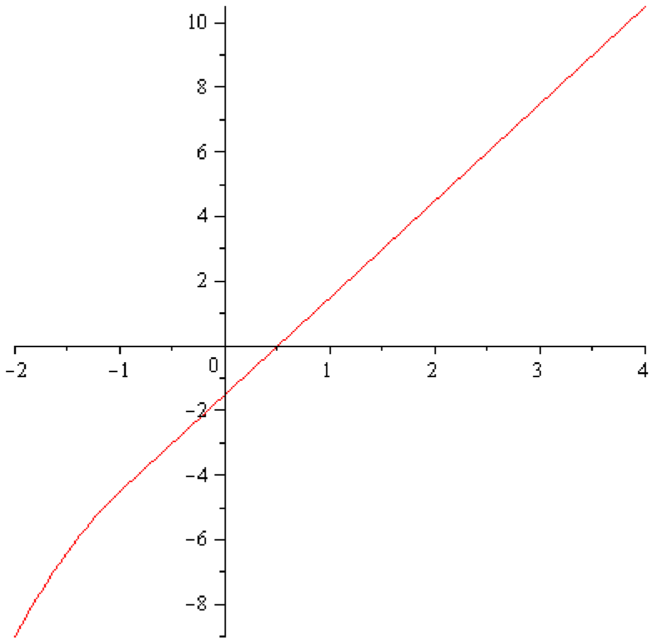
$$\lim_{x \to -1^-} (bx^2 - 3) = \lim_{x \to -1^+} (ax+b)$$

$$b(-1)^2 - 3 = a(-1) + b$$

$$b - 3 = b - a$$

$$-3 = -a$$

$$3 = a$$


10
8
6
4
2
0
-2
-4
-6
-8
-2
-1
1
2
3
4

3.3 #55 write the limit definition for the derivative of

$f(x) = x^{9/17}$ @ $x=3$

Two Ways:

$$\lim_{h\to 0} \frac{f(3+h)-f(3)}{h} = \lim_{h\to 0} \frac{(3+h)^{9/17} - 3^{9/17}}{h}$$

$$\lim_{z\to 3} \frac{f(z)-f(3)}{z-3} = \lim_{z\to 3} \frac{z^{9/17} - 3^{9/17}}{z-3}$$ is

HARD But, if asked to evaluate the limit, you'd say "This is the derivative of $f(x)=x^{9/17}$, evaluated at $x=3$.

$f'(x) = \frac{9}{17} x^{-\frac{8}{17}}$

$f'(3) = \frac{9}{17}(3)^{-\frac{8}{17}}$

Sep 19-12:49 PM

$$\lim_{x\to 1} \frac{x^{50}-1}{x-1} = \lim_{x\to 1} \frac{x^{50}-1^{50}}{x-1} = 50(1)^{49} = 50$$

$$f(x) = x^{50} \Rightarrow f'(x) = 50x^{49} \Rightarrow f'(1) = 50$$

$$f'(1) = \lim_{x\to 1} \frac{f(x)-f(1)}{x-1}$$

Goes back to alternate way of evaluating $f'(a) = \lim_{h\to 0} \frac{f(a+h)-f(a)}{h}$

$$= \lim_{z\to a} \frac{f(z)-f(a)}{z-a} = \boxed{\lim_{x\to a} \frac{f(x)-f(a)}{x-a}}$$

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