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No graphing calculator or Smartphone Apps!

$3x^2 - 9x + 7$

$= 3(x^2 - 3x \quad) + 7$

$\frac{3}{2} \rightsquigarrow \left(\frac{3}{2}\right)^2 = \frac{9}{4}$

$= 3\left(x^2 - 3x + \left(\frac{3}{2}\right)^2\right) + 7 - 3\left(\frac{9}{4}\right)$

$7 - 3\left(\frac{9}{4}\right)$

$= 7 - \frac{27}{4}$

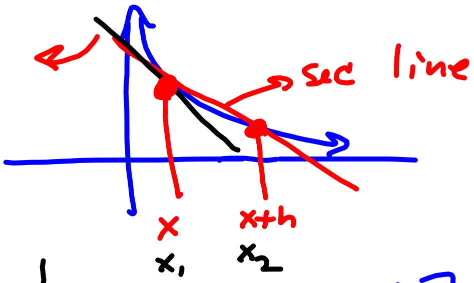
$= \frac{7}{1} \cdot \frac{4}{4} - \frac{27}{4}$

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

$= 3\left(x - \frac{3}{2}\right)^2 + \frac{1}{4}$

$(h, k) = \left(\frac{3}{2}, \frac{1}{4}\right)$, from $ax^2 + bx + c = a(x-h)^2 + k$

$$\frac{f(x+h)-f(x)}{h} = m_{sec}$$



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

LCD = $\sqrt{x+h}\sqrt{x}$

$$\frac{f(x+h)-f(x)}{h} = \frac{\frac{1}{\sqrt{x+h}} - \frac{1}{\sqrt{x}}}{\frac{h}{1}} = \frac{1}{h}\left[\frac{1}{\sqrt{x+h}} - \frac{1}{\sqrt{x}}\right]$$

See Board Shot.

$$= \frac{1}{h}\left[\frac{1}{\sqrt{x+h}}\cdot\frac{\sqrt{x}}{\sqrt{x}} - \frac{1}{\sqrt{x}}\cdot\frac{\sqrt{x+h}}{\sqrt{x+h}}\right]$$

$$= \frac{1}{h}\left[\frac{\sqrt{x}-\sqrt{x+h}}{\sqrt{x}\sqrt{x+h}}\right]\left[\frac{\sqrt{x}+\sqrt{x+h}}{\sqrt{x}+\sqrt{x+h}}\right]$$

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

$$= \frac{1}{h}\left[\frac{(\sqrt{x})^2-(\sqrt{x+h})^2}{\sqrt{x}\sqrt{x+h}(\sqrt{x}+\sqrt{x+h})}\right]$$

$$\left(\frac{a+bi}{c+di}\right)\left(\frac{c-di}{c-di}\right) = \frac{\sim\sim}{c^2+d^2}$$

$$= \frac{1}{h}\left[\frac{x-(x+h)}{\sqrt{x}\sqrt{x+h}(\sqrt{x}+\sqrt{x+h})}\right]$$

$$= \frac{1}{h}\left[\frac{-h}{\sqrt{x}\sqrt{x+h}(\sqrt{x}+\sqrt{x+h})}\right]$$

$$= \frac{-1}{\sqrt{x}\sqrt{x+h}(\sqrt{x}+\sqrt{x+h})} \xrightarrow{h\to 0} \frac{-1}{\sqrt{x}\sqrt{x}(\sqrt{x}+\sqrt{x})}$$

$$= \frac{-1}{x(2\sqrt{x})} = \boxed{\frac{-1}{2x\sqrt{x}}} = \frac{-1}{2x^1x^{\frac{1}{2}}} = \frac{-1}{2x^{3/2}} = -\frac{1}{2}x^{-\frac{3}{2}}$$

$\sqrt{x}\sqrt{x} = x$

$(\sqrt{x})^2 = x$

$\sqrt{x^2} = |x|$

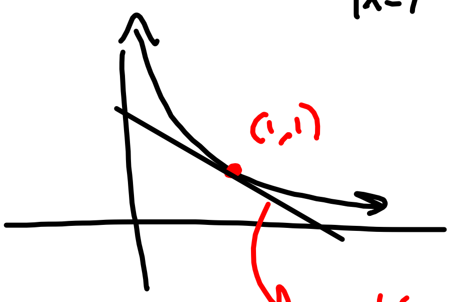
So, $m_{tan} =$

$= f'(x) = \frac{-1}{2x\sqrt{x}}$

So, the slope of $\frac{1}{\sqrt{x}}$ @ $x=1$ is

$$f'(1) = m_{tan}\Big|_{x=1} = \frac{-1}{2(1)(\sqrt{1})} = -\frac{1}{2} = m$$

$$\boxed{y = m(x - x_1) + y_1}$$



$y = -\frac{1}{2}(x-1) + 1$ is equayzhen of tangent line to $f(x) = \frac{1}{\sqrt{x}}$

$y = -\frac{1}{2}(x-1) + 1$ @ $x=1$ (i.e. @ (1,1))

#1

$f(-1)=2$

$P(-1,2)$: $x_1=-1,\ y_1=2$

$$m=\frac{f(x_2)-f(x_1)}{x_2-x_1}=m_{sec}=\frac{f(1.001)-f(1)}{1.001-1}$$

$$=\frac{f(1.001)-2}{-1.001-(-1)}=\frac{\quad}{-.001}$$

2

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

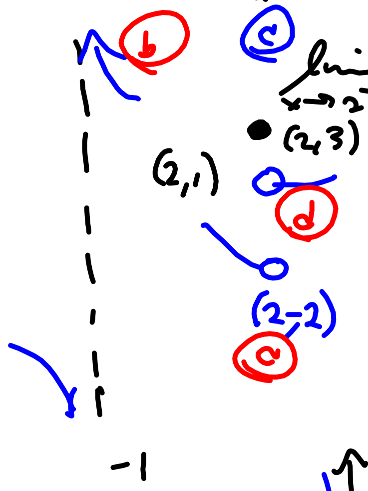
b) $\lim_{x\to -1^+} f(x)=+\infty$

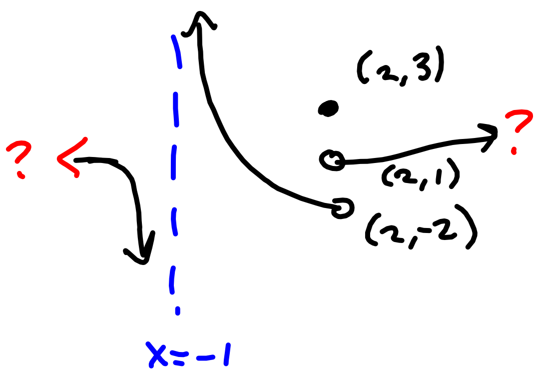
c) $\lim_{x\to 2^-} f(x)=-2$

d) $\lim_{x\to 2^+} f(x)=1$

e) $f(2)=3$

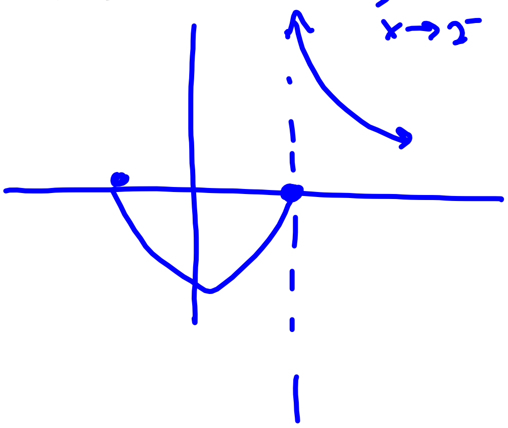
f





(6) (d) $\lim_{x\to 2} f(x) \nexists$

$\lim_{x\to 2^-} f(x) = 3 \neq \infty = \lim_{x\to 2^+} f(x)$



Alternate version of difference quotient.

$$\frac{f(x+h)-f(x)}{h} = \frac{f(x_2)-f(x_1)}{x_2-x_1} = \frac{f(x)-f(c)}{x-c}$$

#7 is saying $x_1 = c = 3$ & wants the slope @ $x=3$

$$\frac{f(x)-f(3)}{x-3} = \frac{x^2+x+2-(3^2+3+2)}{x-3}$$

$$= \frac{x^2+x+2-14}{x-3} = \frac{x^2+x-12}{x-3} = \frac{(x-3)(x+4)}{x-3} = x+4$$

$(x \neq 3)$

$$\frac{f(x)-f(c)}{x-c} = \frac{x^2+x+2-c^2-c-2}{x-c}$$

$$= \frac{x^2-c^2+x-c}{x-c} = \frac{(x-c)(x+c)+(x-c)}{x-c}$$

$$= \frac{(x-c)[x+c+1]}{x-c} = \underset{x \neq c}{x+c+1} \xrightarrow{x \to c} c+c+1$$

$$= 2c+1 = f'(c)$$

$$c=3 \Rightarrow f'(3)=7$$