§2.1

#1 : a compute the m_{sec}'s 1pt

b $m_{tan} \approx -33.3$ 1pt

#3 b $m_{tan} = .25$ @ $x=1$ 1pt

c $y = .25(x-1) + \frac{1}{2}$ is fine 1pt

Note 1/4x and $\frac{1}{4x}$ and anything else unclear is going to cost you

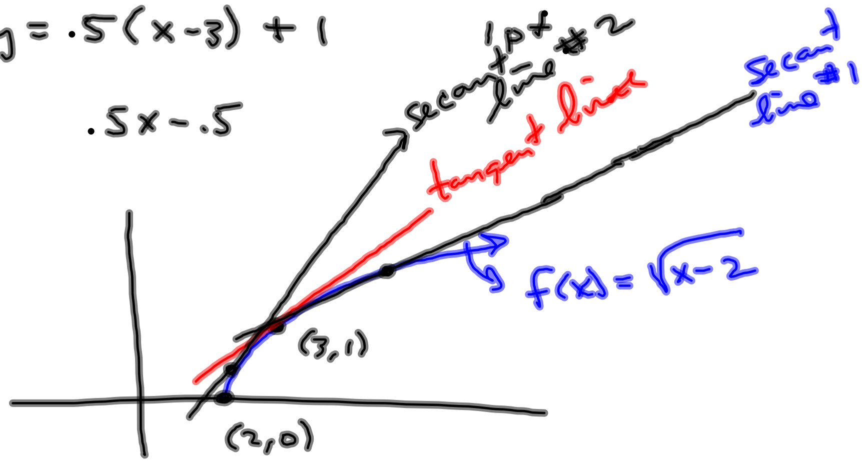
$\frac{1}{4}x + \frac{1}{4}$ was OK answer.

$\frac{1}{4}x$ $\frac{x}{4} + \frac{1}{4}$ $.25x + .25$

4c $y = .5(x-3) + 1$ 1pt

$.5x - .5$

d. 1pt



§2.1 solns posted.

9. a They don't appear to be approaching a limit 1pt

8pts Plus 2pts for context.

$\frac{8}{10} + \frac{2}{10} = \frac{10}{10}$

c. $m \approx -31.42 \approx m_{tan}$, using $x = 1.00001$ was my 2^{nd} x-value.

The following was stated as fact/definition in Section 2.2. Now it is presented as a *consequence* of the laws and properties we've been given.
The following was stated as fact/definition in Section 2.2. Now it is presented as a *consequence* of the laws and properties we've been given. Not quite sure how the proof might go, using only the assumptions and definitions we have.

But no worry. The author is mainly reminding us of something that can be used as a *tool*, when we're faced with a situation calling for left- and right-handed limits.

$\boxed{1}$ **THEOREM** $\lim_{x\to a} f(x) = L$ if and only if $\lim_{x\to a^-} f(x) = L = \lim_{x\to a^+} f(x)$

EXAMPLE 7 Show that $\lim_{x\to 0} |x| = 0$.

$$f(x) = |x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

$$\therefore \lim_{x\to 0^-} f(x) = \lim_{x\to 0^-} (-x) = -\lim_{x\to 0^-} (x) = -0 = 0$$

#3 #8

§2.3 #'s 3, 8 ask for you to supply the Limit Law you used.

$$\therefore \lim_{x\to 0^+} f(x) = \lim_{x\to 0^+} (x) = 0$$

#8

Combine: $\lim_{x\to 0^-} |x| = 0 = \lim_{x\to 0^+} |x|$

$$\Longrightarrow \lim_{x\to 0} |x| = 0.$$

$$\lim_{x\to 3}\sqrt{5x^2+3x-11}$$

$\sqrt{25} = 5$

$\sqrt{16+9} = \sqrt{16}+\sqrt{9} = 4+3=7$

No.

#11

$$= \sqrt{\lim_{x\to 3}(5x^2+3x-11)}$$

$$= \sqrt{\lim_{x\to 3}(5x^2) + \lim_{x\to 3}(3x) + \lim_{x\to 3}(-11)}$$

#1

$$= \sqrt{5\lim_{x\to 3}(x^2)}$$

Like #8

Jan 25-12:36 PM

3–9 Evaluate the limit and justify each step by indicating the appropriate Limit Law(s).

4. $\displaystyle \lim_{x \to 2} \frac{2x^2 + 1}{x^2 + 6x - 4} = \frac{\displaystyle\lim_{x\to 2} (2x^2+1)}{\displaystyle\lim_{x\to 2} (x^2+6x-4)} = \lim \ldots,$ etc.

\#5

Like Kelly's #8 question.

Scratch:

$2^2+6(2)-4=12$

$2(2)^2+1=9$

This one can be clobbered with **Direct Substitution Property**, but for this problem stretch, we want to use **Limit Laws 1 - 11**.

10. (a) What's wrong with the following equation?

$$\frac{x^2+x-6}{x-2}=x+3$$

$$\frac{x^2+x-6}{x-2}=\frac{(x+3)\cancel{(x-2)}}{\cancel{x-2}}=x+3 \;, x\neq 2$$

Need this.

(b) In view of part (a), explain why the equation

Hint: See Page 81

$$\lim_{x\to 2}\frac{x^2+x-6}{x-2}=\lim_{x\to 2}(x+3)$$

is correct.

The limits agree as $x\to 2$, because the functions agree except at $x=2$

11–30 Evaluate the limit, if it exists.

#18 gives us a chance to review our factoring skills...

18. $\lim_{x \to 1} \frac{x^3 - 1}{x^2 - 1}$

Factor Theorem:

$x^3 - 1 = 0$

$x^3 = 1$

$\sqrt[3]{x^3} = \sqrt[3]{1}$

$\boxed{x = 1}$

$$\begin{array}{r|rrrr} 1 & 1 & 0 & 0 & -1 \\ & & 1 & 1 & 1 \\ \hline & 1 & 1 & 1 & 0 \\ & x^2 & x^1 & c & r \end{array}$$

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

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

$$\frac{x^3-1}{x^2-1} = \frac{\cancel{(x-1)}(x^2+x+1)}{\cancel{(x-1)}(x+1)} = \frac{x^2+x+1}{x+1} \xrightarrow{x \to 1} \frac{1^2+1+1}{1+1} = \frac{3}{2}$$

$$\lim_{x \to 1} \frac{x^3-1}{x^2-1} = \lim_{x \to 1} \frac{\cancel{(x-1)}(x^2+x+1)}{\cancel{(x-1)}(x+1)} = \lim_{x \to 1} \frac{x^2+x+1}{x+1} = \frac{1^2+1+1}{1+1} = \frac{3}{2}$$

GET THE NOTATION RIGHT.

Jan 25-1:03 PM

Standard limits that will come up repeatedly are of the form

$$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

for example #s 17, 23, 28, 30 (even though it might not look like it).

1
1 1
1 2 1
1 3 3 1

20. $\lim_{h \to 0} \frac{(2+h)^3 - 8}{h}$:

$$\frac{(2+h)^3 - 8}{h} =$$

$$\frac{1(2)^3(h)^0 + 3(2)^2(h) + 3(2)^1(h^2) + 1(2)^0(h)^3 - 8}{h}$$

$$= \frac{2^3 + 12h + 6h^2 + h^3 - 8}{h} = \frac{12h + 6h^2 + h^3}{h}$$

$$= \frac{\cancel{h}(12 + 6h + h^2)}{\cancel{h}} = 12 + 6h + h^2 \xrightarrow{h \to 0} \boxed{12}$$

22. $\lim_{h \to 0} \frac{\sqrt{1+h} - 1}{h}$

$\boxed{2.3\text{I}}$ Thursday