MATH 234
PRACTICE TEST 1

(1) Find the tangent line to $y = \frac{2x-1}{1-x^3}$ at $x=0$. (Put in $y=mx+b$ form)

(2) Find line thru $(2,4)$ parallel to $2y=3x+1$ (put in $y=mx+b$ form)

(3) Find $\lim_{x\to -1^-}$, $\lim_{x\to -1^+}$ of $f(x)=\begin{cases} \frac{1}{x-1} & \text{if } x<-1 \\ x^2+2x & \text{if } x\geq -1 \end{cases}$

(4) Use definition of deriv. to compute $f'(x)$, if $f(x)=x^2+3$

(5) Compute $\lim_{x\to +\infty}$, $\lim_{x\to -\infty}$ of $\frac{1-2x^2}{x+1}$

(6) Graph $f(x)=\begin{cases} x(3-x) & \text{if } -1\leq x\leq 3 \\ x & \text{if } x>3 \end{cases}$

- describe how to find local min/max and determine possibilities (you need <u>not</u> say if min/max)
- describe domain, range, and where continuous.

M234 PT 1 SOLS

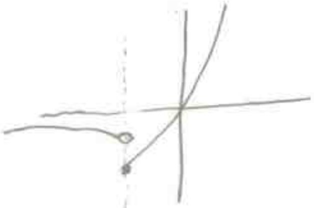
1) $x=0 \Rightarrow y=\dfrac{2\cdot 0-1}{1-(0)^3} = \dfrac{-1}{1} \Rightarrow (0,-1)$ point on line

$y' = \dfrac{(1-x^3)\cdot 2-(2x-1)(-3x^2)}{(1-x^3)^2}$, so $y'(0)=\dfrac{2-(-1)\cdot 0}{1} = 2 = \text{slope}.$

<u>SOLN:</u> $y-(-1)=2(x-0) \Rightarrow \boxed{y=2x-1}$

2) $y=\frac{3}{2}x+\frac{1}{2} \Rightarrow m=3/2$, thru $(2,4) \Rightarrow (y-4)=\frac{3}{2}(x-2) \Rightarrow \boxed{y=\frac{3}{2}x+1}$

3)



SOLN: $\lim\limits_{x\to -1^-} = -\frac{1}{2}$ (vert asymptote is at $x=1$)

$\lim\limits_{x\to -1^+} = -1$

4) $f'(x) = \lim\limits_{h\to 0} \dfrac{f(x+h)-f(x)}{h}$ so: $\lim\limits_{h\to 0} \dfrac{(x+h)^2+3-(x^2+3)}{h} = \lim\limits_{h\to 0}\dfrac{x^2+2xh+h^2+3-x^2-3}{h}$

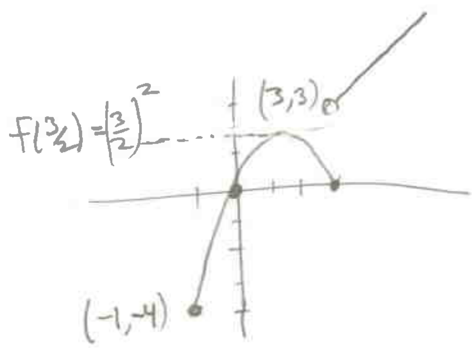
$= \lim\limits_{h\to 0} \dfrac{2xh+h^2}{h} = \lim\limits_{x\to 0} 2x+h = 2x.$

5) $\dfrac{1-2x^2}{x+1} = \dfrac{\frac{1}{x}-\frac{2x^2}{x}}{1+\frac{1}{x}}$ so, as $x\to\infty$, $\frac{1}{x}\to 0$, but $-2x\to-\infty$

so we get $\lim\limits_{x\to\infty} \dfrac{\frac{1}{x}-2x}{1+1/x} \to \dfrac{0-\infty}{1+0} = -\infty$

For $-\infty$, the sign gets flipped, so $\lim\limits_{x\to-\infty} = +\infty$

6)



$f' = 3-2x$ when $-1<x<3$

so this is zero if $x=3/2$, possible local max/min

$f'=1$ if $x>3$, so no poss local min max.

<u>Domain</u>: defined if $x\geq -1$

<u>range</u>: $[-4 .. \frac{9}{4}]$ and $y>3$

Continuous: all $x\geq -1$ except $x=3$.