C. Buell
MA 131-001 TEST2A

NAME Key ROW/SIDE _____

You must show all of your work for credit. You may use a calculator TI-84 or less.

1. (21) Limits. Solve the following limits.

a) $\lim_{x\to 3} \frac{|x-3|}{x-3}$

x	f(x)
2.9	-1
2.99	-1
2.999	-1

x	f(x)
3.1	1
3.01	1
3.001	1

limit does not exist

b) $\lim_{x\to 4} 2x - 3$

$2(4) - 3 = \boxed{5}$

c) $\lim_{x\to 0} \frac{x^2+4x}{x}$

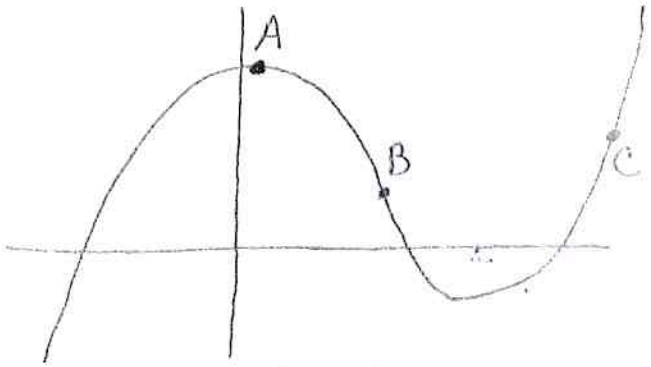
$\frac{0^2+4(0)}{0} = \frac{0}{0}$ use cancellation $\frac{x(x+4)}{x}$

$\lim_{x\to 0} x+4 = \boxed{4}$

2. (24) Given the graph. At the points A, B, and C, select ALL the statements that describe that point.

CHOICES:

a) f(x) increasing b) f(x) decreasing c) f(x) concave up d) f(x) concave down
e) relative max/min f) inflection point g) f'(x) increasing h) f'(x) decreasing
i) f'' (x) > 0 j) f'' (x) < 0 k) slope increasing l) slope decreasing m) f'' (x) =0 n) f'(x) = 0



I) POINT A

d, e, h, j, l, n

II)POINT B

b, f, m

III)POINT C

a, c, g, i, k

3. (17) A helicopter is rising straight up with its position given at the formula $s(t) = t^2+t$, after t secs.

a) How long does it take to rise to a position of 20ft?

$t^2 + t = 20$
$t^2 + t - 20 = 0$
$(t+5)(t-4) = 0$ $t = -5, 4$

4 secs

b) Find the velocity and the acceleration when the helicopter is 20 feet in the air. (Hint use part (a))

$v(t) = 2t+1$ $v(4) = 2(4)+1 = \boxed{9\ ft/sec}$

$a(t) = 2$ $\boxed{2\ ft/sec^2}$

4. (20)There is 1000ft of fencing to surround the running track pictured below. What is the maximum area that can be enclosed inside the fencing?

$A = 2hx + \pi h^2$

$P = 1000 = 2h\pi + 2x$

$x = \frac{1000 - 2h\pi}{2} = 500 - h\pi$

$A = 2h(500 - h\pi) + \pi h^2 = 1000h - 2h^2\pi + \pi h^2 = 1000h - \pi h^2$

$A' = 1000 - 2\pi h = 0 \Rightarrow 1000 = 2\pi h \quad h = \frac{500}{\pi}$

check

$A'' = -2\pi < 0 \Rightarrow h$ is a max

$A = 1000\left(\frac{500}{\pi}\right) - \pi\left(\frac{500}{\pi}\right)^2 \approx$

5. (18)Find the y'.

a) $y = \frac{4x^2+2x-1}{5x-2}$

$y' = \frac{(8x+2)(5x-2) - 5(4x^2+2x-1)}{(5x-2)^2}$

$f = 4x^2 + 2x - 1 \qquad g = 5x - 2$

$f' = 8x + 2 \qquad g' = 5$

b) $y = (5x^2 + x)\sqrt[3]{2x-4}$

$f = (5x^2 + x) \qquad g = \sqrt[3]{2x-4}$

$y' = (10x+1)\left(\sqrt[3]{2x-4}\right) + \frac{1}{3}(2x-4)^{-2/3}(2)(5x^2+x)^3$

$f' = 10x + 1$

$g' = \frac{1}{3}(2x-4)^{-2/3}(2)$

c) $y = h(x)^3 + f(x)g(x) + 5$

$y' = 3h(x)^2 h'(x) + f'(x)g(x) + g'(x)f(x)$

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MA 131-001 TEST2A

NAME Key ROW/SIDE _____

You must show all of your work for credit. You may use a calculator TI-84 or less.

1. (21) Limits. Solve the following limits.

a) $\lim_{x\to 2} \frac{|x-2|}{x-2}$

x	f(x)
1.9	-1
1.99	-1
1.999	-1

x	f(x)
2.1	1
2.01	1
2.001	1

limit DNE

b) $\lim_{x\to 4} 4x + 3$

$4(4) + 3 = \boxed{19}$

c) $\lim_{x\to 0} \frac{3x^2-2x}{x}$

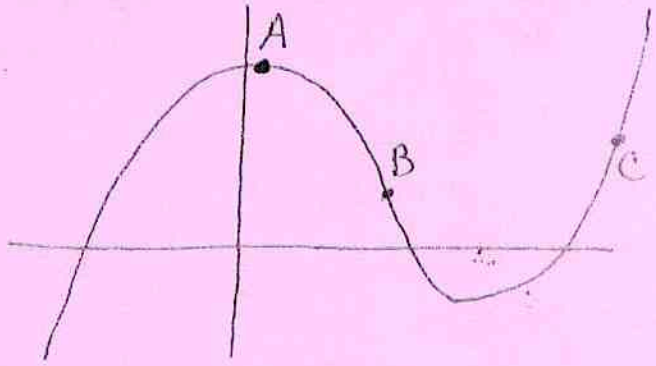
$\frac{3(0)^2-2(0)}{0} = \frac{0}{0}$ use cancellation

$\frac{x(3x-2)}{x}$ $\lim_{x\to 0} 3x-2 = \boxed{-2}$

2. (24) Given the graph. At the points A, B, and C, select ALL the statements that describe that point.

CHOICES:

a) f(x) increasing b) f(x) decreasing c) f(x) concave up d) f(x) concave down
e) relative max/min f) inflection point g) f'(x) increasing h) f'(x) decreasing
i) f'' (x) > 0 j) f'' (x) < 0 k) slope increasing l) slope decreasing m) f'' (x) =0 n) f'(x) = 0



I) POINT A

d, e, h, j, l, n

II)POINT B

b, f, m

III)POINT C

a, c, g, i, k

3. (17) A helicopter is rising straight up with its position given at the formula $s(t) = t^2-t$, after t secs.

a) How long does it take to rise to a position of 20ft?

$t^2-t = 20$
$t^2-t-20=0$
$(t-5)(t+4)=0$ $t=-4, 5$

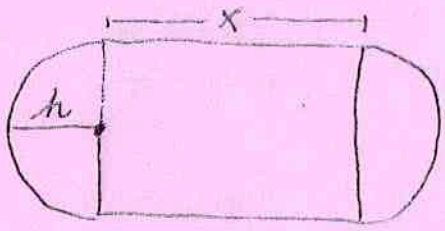
5 sec

b) Find the velocity and the acceleration when the helicopter is 20 feet in the air. (Hint use part (a))

$v(t) = 2t-1$ $v(5) = 2(5)-1 = \boxed{9\ ft/sec}$

$a(t) = 2$ $\boxed{2\ ft/sec^2}$

4. (20)There is 1200ft of fencing to surround the running track pictured below. What is the maximum area that can be enclosed inside the fencing?



$A = 2hx + \pi h^2$

$1200 = 2h\pi + 2x$

$x = \frac{1200 - 2h\pi}{2} = 600 - h\pi$

$A = 2h(600 - h\pi) + \pi h^2 = 1200h - 2h^2\pi + \pi h^2 = 1200h - \pi h^2$

$A' = 1200 - 2\pi h = 0 \Rightarrow 2\pi h = 1200$ so $h = \frac{600}{\pi}$

check $A'' = -2\pi < 0 \rightarrow \cap \rightarrow$ max

$A = 1200\left(\frac{600}{\pi}\right) - \pi\left(\frac{600}{\pi}\right)^2 \approx$

5. (18)Find y′ for each function.

a) $y = \frac{3x^2+x-5}{5x-1}$

$y' = \frac{(6x+1)(5x-1) - 5(3x^2+x-5)}{(5x-1)^2}$

$f = 3x^2 + x - 5 \qquad g = 5x - 1$

$f' = 6x + 1 \qquad g' = 5$

b) $y = (2x^2 + x)\sqrt[3]{3x+7}$

$y' = (4x+1)\sqrt[3]{3x+7} + \frac{1}{3}(3x+7)^{-2/3} \cdot 3 \cdot (2x^2+x)$

$f = (2x^2+x) \qquad g = \sqrt[3]{3x+7}$

$f' = 4x + 1 \qquad g' = \frac{1}{3}(3x+7)^{-2/3} \cdot 3$

c) $y = f(x)^3 + h(x)j(x) + 5$

$y' = 3f(x)^2 f'(x) + h'(x)j(x) + j'(x)h(x)$