EXAM B #10:

LET $f(x) = \begin{cases} x-1 & x<0 \\ x^2 & 0 \le x < 1 \\ 1/x & 1 < x \end{cases}$

CHECK "CHANGE" POINTS: $x=0, 1$

$\lim_{x\to 0^+} f(x) = \lim_{x\to 0^+} x^2 = 0$

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

$\Rightarrow 0 \neq -1$, SO WE HAVE A JUMP DISCONTINUITY AT $x=0$. THIS IS ALSO NONREMOVABLE

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

$\rightarrow$ REMOVABLE DISCONTINUITY @ $x=1$

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

FUNCTION IS NOT DEFINED AT $x=1$!

EXAM B #11:

LET $f(x)$ & $g(x)$ BE FUNCTIONS SUCH THAT $\lim_{x\to a} f(x)$, $\lim_{x\to a} g(x)$ EXIST AND n IS A POSITIVE INTEGER. HOW MANY OF THE FOLLOWING ARE TRUE?

(i) $\lim_{x\to a} \frac{1}{f(x)} = \frac{1}{\lim_{x\to a} f(x)}$ THIS IS ONLY TRUE IF $\lim_{x\to a} f(x) \neq 0$ SO THIS IS NOT ALWAYS TRUE.

(ii) $\lim_{x\to a} (f(x)g(x)) = \lim_{x\to a} f(x) \lim_{x\to a} g(x)$ $\rightarrow$ YES, LIMIT LAW

(iii) $\lim_{x\to a} \sqrt[n]{f(x)} = \sqrt[n]{\lim_{x\to a} f(x)}$ ONLY TRUE WHEN n IS EVEN AND $f(x) \geq 0$, NOT ALWAYS TRUE!

(iv) $\lim_{x\to a}[2f(x) + g(x)^2] = 2(\lim_{x\to a} f(x)) + (\lim_{x\to a} g(x))^2$

TRUE, LIMIT LAWS

$= \lim_{x\to a} 2f(x) + \lim_{x\to a} g(x)^2 = 2\lim_{x\to a} f(x) + (\lim_{x\to a} g(x))^2$

Exam B #13:

FOR WHICH OF THE FOLLOWING CAN WE USE SQUEEZE THEOREM TO DETERMINE LIMIT AS $x \to 0$?

(A) $k(x) = \ln(x-1)$ $\quad \lim_{x\to 0} \ln(x-1)$ DNE (CANNOT TAKE ln OF NEGATIVE #'S)

(B) $h(x) = \frac{1}{x}$ $\quad \lim_{x\to 0} \frac{1}{x}$ UNDEFINED

(C) $g(x) = \sqrt{x-1}$ $\quad \lim_{x\to 0} \sqrt{x-1}$ DNE (CANNOT TAKE SQ. ROOT OF -1)

(D) $f(x) = \cos(1/x)$ $\quad$ IF YOU TRIED TO USE SQUEEZE THEOREM,

$$-1 \le \cos(1/x) \le 1$$

$$\Rightarrow \lim_{x\to 0} -1 \le \lim_{x\to 0} \cos(1/x) \le \lim_{x\to 0} 1$$

$$-1 \le \lim_{x\to 0} \cos(1/x) \le 1$$

SQUEEZE THEOREM DOES NOT APPLY!

$\Rightarrow$ NONE OF THESE

XRONOS HW 7 #2:

$$\frac{d}{dx}\left(2e^{(x-5)}\right) = \frac{d}{dx}\left(2e^{x}e^{-5}\right) = \frac{d}{dx}\left(2e^{-5}e^{x}\right) = 2e^{-5}e^{x} = \boxed{2e^{x-5}}$$

CONSTANT

XRONOS HW 7 #1:

$$\frac{d}{dx}\left(x^4 + 8x^3 + 6x^2 - 40x + 25\right) = 4x^{4-1} + 8(3)x^{3-1} + 6(2)x^{2-1} - 40(1)x^{1-1}$$

$$= \boxed{4x^3 + 24x^2 + 12x - 40}$$

XRONOS HW 7 #4:

FIND THE EQUATION OF THE LINE TANGENT TO $f(x) = -x^3 + 9x^2 - 6x + 9$ AT THE POINT $(7, 65)$

STEP ONE: FIND $\frac{d}{dx}[f(x)]$

$$\frac{d}{dx}\left[-x^3 + 9x^2 - 6x + 9\right] = -3x^{3-1} + 9(2)x^{2-1} - 6x^{1-1}$$

$$= -3x^2 + 18x - 6$$

$$\Rightarrow f'(x) = -3x^2 + 18x - 6$$

STEP TWO: THE SLOPE OF THE TANGENT LINE AT $(7, 65)$ IS THE VALUE OF $f'(x)$ AT $x = 7$:

$$f'(7) = -3(7^2) + 18(7) - 6 = -147 + 126 - 6 = -27$$

SLOPE OF TANGENT LINE @ $x = 7$

STEP THREE: POINT-SLOPE FORM: $y - y_1 = m(x - x_1)$, $x_1 = 7$, $y_1 = 65$, $m = -27$

$$y - 65 = -27(x - 7)$$

$$y - 65 = -27x + 189$$

$$\boxed{y = -27x + 254}$$