Problem 1:   Using the definition of a derivative find $f'(x)$ if $f(x) = x^3 - 2x + 2010$.

Work:

Problem 2:   Using the rules of differentiation find the derivative of $g(x) = 2x^{2010} - \frac{1}{2}x^{2000} + \frac{10}{x^6}$.

Work:

Problem 3: If $g(x) = 2x^6 - 12x^3$ and $f(x) = 12x^3 + 4x^4$ find the derivative of $\frac{f(x)}{g(x)}$.

Work:

Problem 4: If $f(x) = 2x - x^{2010}$ and $g(x) = x^{23} - 2010 + x^{22}$ find the derivative of $f(x)g(x)$.

Work:

Problem 5: If $f(x) = \begin{cases} x + 2010, & \text{if } x < 3 \\ -2013, & \text{if } x = 3 \\ x^2 + 2004, & \text{if } x > 3 \end{cases}$

(a) find $\lim\limits_{x \to 3^-} f(x)$, $\lim\limits_{x \to 3^+} f(x)$, $\lim\limits_{x \to 3} f(x)$;

(b) is f continuous at 3?

Work: (a)

(b)

Problem 6: Suppose that $a_1 = 1$ and that $a_n = \frac{a_{n-1}}{n}$ for $n \geq 2$.

(i) Find a_5.

$a_5 = $ _____

(ii) What statement (circle only one) is true about the sequence $\{a_n\}_{n=1}^{\infty}$?

(a) $\{a_n\}_{n=1}^{\infty}$ is increasing

(b) $\{a_n\}_{n=1}^{\infty}$ is decreasing

(c) $\{a_n\}_{n=1}^{\infty}$ is neither decreasing nor increasing

(iii) Why does the limit: $\lim\limits_{n \to \infty} a_n$ exist? Give a 1 line answer!

(iv) What is $\lim\limits_{n \to \infty} a_n$?

$\lim\limits_{n \to \infty} a_n = $ _____

Problem 7: Find the equation of the tangent line to the graph of $f(x) = \frac{x}{x+2}$ at the point $(1, \frac{1}{3})$. Hint: Recall that such an equation has the form $y = mx + n$. What is the meaning of m? Find m and n.