**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Calculus 12**

**4.0 Existence Theorems**

**Assignment**

**A. Mean Value Theorem**

 1) Given $f\left(x\right)=5-\frac{4}{x}$ , find all *c* in the interval [1, 4], such that $f^{'}\left(c\right)=\frac{f\left(4\right)-f(1)}{4-1}$

 2) The height of an object *t* seconds after it was dropped from a height of 500 feet is given by $s\left(t\right)=-16t^{2}+500$

 a) Find the average velocity of the object during the first 3 seconds.

 b) Use the Mean Value Theorem to verify that at some time during the first three seconds of fall the instantaneous velocity equals the average velocity. Find that time.

Answers: 1) $c=2$ 2a) $-48$ ft/sec b) $t=\frac{3}{2}$ seconds

**B. Rolle’s Theorem**

1) In each question, determine whether Rolle’s Theorem can be applied to *f* on the indicated interval. If it can be applied, find all values of *c* in the interval such that $f^{'}\left(c\right)=0$

 a) $f\left(x\right)=x^{2}-2x [0, 2]$

 b) $f\left(x\right)=3x^{3}-4 [-2, 2]$

 c) $f\left(x\right)=\left(x-1\right)\left(x-2\right)\left(x-3\right) \left[1, 3\right]$

 d) $f\left(x\right)=x^{4}-2x^{2} [-2, 2]$

Answers: a) $c=1$ b) does not apply c) $c=\frac{6\pm \sqrt{3}}{3}$ d) $c=0, \pm 1$