

## CALCULUS I—Worksheet #18

1. Find  $c$  for Rolle's Theorem for  $f(x)=x^3 - 12x$  when  $0 \leq x \leq 2\sqrt{3}$ .

2. Why does  $f(x)=\frac{x^2 - 4x}{x - 2}$  on  $[0,4]$  not satisfy the hypotheses of Rolle's Theorem?

3. Find  $c$  for the Mean Value Theorem for  $f(x)=3x^2+4x-3$  on  $[1,3]$

4. Find  $c$  for the Mean Value Theorem for  $f(x)=\ln x$  on  $[1,2e]$ .

5.-7 Solve using the method of variables separable.

5.  $y \, dy - 4x \, dx=0$

6.  $y^2 \, dy - 3x^5 \, dx=0$

7.  $\frac{dy}{dx} = \frac{1 + y^2}{1 + x^2}$

8.  $f(x) = 5 - x$  when  $-1 \leq x \leq 2$  and  $f(x) = x^2 - 1$  when  $2 < x \leq 3$ . Show all steps in showing that  $f(x)$  is continuous at  $x = 2$ .

9.  $g(x) = \frac{x^2 - 2x - 3}{x - 3}$  when  $x$  is not 3 and  $g(x) = k$  when  $x = 3$ . Find  $k$  so that  $g(x)$  is continuous at  $x = 3$ .

10. Find  $c$  for the Mean Value Theorem if  $f(x) = \sqrt{1 - x^2}$  on  $[-1,1]$ ?

11. Why doesn't the Mean Value Theorem apply to  $f(x) = x^2 - x^{\frac{2}{5}}$  on  $[-1,1]$ ?

12. Why doesn't the Mean Value Theorem apply to  $f(x) = \frac{x}{x + 1}$  on  $[-2,0]$ ?

13. Find  $c$  in  $[1,4]$  determined by the Mean Value Theorem for  $f(x) = x - \sqrt{x}$ .

14.  $f(x) = \frac{1}{x}$  for  $x \leq -1$ ,  $f(x) = \frac{x-1}{2}$  for  $-1 < x < 1$ ,  $f(x) = \sqrt{x}$  for  $x \geq 1$ . Is  $f(x)$  continuous at  $x = -1$ ? Show all 3 steps.

15. Why is the function in problem 14 NOT continuous at  $x=1$ ?

16. (a)  $\int \sin^3 2x \, dx$       (b)  $\int \sin^2 2x \, dx$

17.  $\int 5^x \, dx$