SI Session Week 7
Thursdays 4:00 – 5:30 PM, Rm. 1229
Fridays 2:00 – 3:30 PM. Rm. 1223

Prof. Stockton : Calculus I : Fall 2007
SI Leader : Neil Jody

Directions: Evaluate and/or calculate as indicated.

Tips: $\frac{d}{dx}\left[f(x)g(x)\right] = f(x)g'(x) + g(x)f'(x)$

$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - f(x)g'(x)}{\left(g(x)\right)^2}$

1. Rolle's Theorem: Let f be continuous on the closed interval $[a,b]$ and differentiable on the open interval (a,b). If $f(a)=f(b)$, then there is at least one point c in the interval (a,b) such that $f'(c) = 0$.
    What does this mean?

12. If $y = \sec^3\left(\frac{\pi}{2} - x\right)$,

    find equation of tangent line at $x = -\frac{\pi}{2}$

For the following find the derivative and critical values of f.

2. Mean-Value Theorem: Let f be continuous on the closed interval $[a,b]$ and differentiable on the open interval (a,b). Then there is at least one point c in (a,b) such that
    $f'(c) = \frac{f(b) - f(a)}{b - a}$.
    What does this mean?

13. $f(x) = x - \sin(x)$

14. $f(x) = \dfrac{3x}{\sqrt{4x^2 + 1}}$

15. $f(x) = \sqrt{x^2 - 3x - 10}$

3. Find the extrema of $f(x) = \sqrt[3]{x^2} - x$,on the interval $[-1, 2]$

16. $f(x) = \dfrac{x^2 - 9}{(x+1)^2}$

4. A stone is dropped into a lake causing circular waves whose radii increase at a constant rate 0f 0.5m/sec. At what rate is the circumference of a wave changing when its radius is 4m?

17. $f(x) = \sqrt{x}(x - 2)^2$

18. $f(x) = x - x^{2/3}$

5. Boyle's law for gases states that pv=c, for pressure p, volume v, and a constant c. At a certain instant the volume in $75\ in^3$, the pressure is $30\ lb/in^2$, and the pressure is decreasing at a rate of 2 lb/in^2 /min. At what rate is the volume changing at this instant?

19. $f(x) = \sin^2(x)$

20. $f(x) = \cos(x) - \sin(2x)$

21. $f(x) = \cos(2x) + \cos(x)$

6. $\dfrac{d}{dx}\left[x^2 = \dfrac{x+y}{x-y}\right]$

22. $f(x) = \sin^2(x) + \cos(x)$

Find the Extrema and Mean Values on in the given intervals.

7. $\dfrac{d}{dx}\left[\dfrac{1}{\sqrt{x}} + \dfrac{1}{\sqrt{y}} = 1\right]$

23. $f(x) = \cos(x); \left[\frac{\pi}{2}, \frac{3\pi}{2}\right]$

8. $\dfrac{d}{dx}\left[\sqrt{x}\tan^3\left(\sqrt{x}\right)\right]$

24. $f(x) = \frac{1}{2}x - \sqrt{x}; [0,4]$

9. $\dfrac{d}{dx}\left[x^5 \sec\left(\dfrac{1}{x}\right)\right]$

25. $f(x) = \frac{1}{X^2} - \frac{4}{3X} + \frac{1}{3}; [1,3]$

10. $\dfrac{d^2y}{dx^2}\left[x\cos(5x) - \sin^2(x)\right]$

11. $\dfrac{d^2y}{dx^2}\left[x\tan\left(\dfrac{1}{x}\right)\right]$