SI Session: July 2nd
Mondays – Thursdays
12:30 PM – 2:00 PM
Room 1229

Prof. Stockton : Calculus I
Summer I 2008
SI Leader : Neil Jody

[1] Find all points on the parabola $y = 4 - x^2$ which are closest to the point (0,2).

[2] Find the dimensions of the rectangle of maximum area that can be inscribed in a semicircle of radius 4.

[3] Determine the dimensions of a rectangular solid (with a square base) of maximum volume if its surface area is 150 square inches.

[4] Farmer John wants to create a pig pen. The pen is to be a rectangle divided into three subrectangles. He has exactly 300 feet of wire to create the pen. Find the dimensions of the pen with maximum area.

[5] Use the given information to evaluate and compare dy and Δy.

(a) $y = \dfrac{x}{x^2 + 1}$; from $x = 2$ to $x = 2.96$

(b) $y = \sqrt{x^2 + 8}$; from $x = 1$ to $x = 0.97$

[6] Find the differential dy for the given function.

(a) $y = x \cos x$

(b) $y = 1/x^3$

[7] Find each antiderivative.

(a) $\int\left(-8x^3+15x^5\right)dx$

(b) $\int\left(\sec^2 x\right)dx$

(c) $\int\left(x^3-3x+\sqrt[4]{x}-5\right)dx$

(d) $\int x\left(x+\sqrt{x}\right)dx$

(e) $\int\left(\frac{x^2+3x-1}{x^4}\right)dx$

1. $\frac{d}{dx}\left[c\,f(x)\right] = c\,\frac{d}{dx}\left[f(x)\right]$

2. $\frac{d}{dx}\left[f(x) \pm g(x)\right] = \frac{d}{dx}\left[f(x)\right] \pm \frac{d}{dx}\left[g(x)\right]$

3. $\frac{d}{dx}\left[\mathrm{f}(x)\,g(x)\right] = \mathrm{f}'(x)\,g(x) + \mathrm{f}(x)\,g'(x)$

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

5. $\int cf(x)\,dx = c\int f(x)\,dx$

6. $\int\left[f(x) \pm g(x)\right]dx = \int f(x)\,dx \pm \int g(x)\,dx$

7. $\int x^n dx = \frac{x^{n+1}}{n+1} + C, \text{if } n \neq -1$

8. $\int x^n dx = \ln|x| + C, \text{if } n = -1$

9. $\int \sin x\,dx = -\cos x + C$

10. $\int \cos x\,dx = \sin x + C$

11. $\int \sec^2 x\,dx = \tan x + C$

12. $\int \csc^2 x\,dx = -\cot x + C$

13. $\int \sec x \tan x\,dx = \sec x + C$

14. $\int \csc x \cot x\,dx = -\csc x + C$

15. $\int \sec x\,dx = \ln\left|\sec x + \tan x\right| + C$

16. $\int \tan x\,dx = -\ln\left|\cos x\right| + C$

17. $\int \cot x\,dx = \ln\left|\sin x\right| + C$

18. $\int \csc x\,dx = \ln\left|\csc x - \cot x\right| + C$

19. $\sin^2(\theta) + \cos^2(\theta) = 1$

20. $\tan^2(\theta) + 1 = \sec^2(\theta)$

21. $1 + \cot^2(\theta) = \csc^2(\theta)$

22. $\sin(2\theta) = 2\sin(\theta)\cos(\theta)$

23. $\cos(2\theta) = \begin{cases} \cos^2(\theta) - \sin^2(\theta) \\ 2\cos^2(\theta) - 1 \\ 1 - 2\sin^2(\theta) \end{cases}$

24. For all real numbers y, and all positive numbers a and x, where $a \neq 1$:

$\log_b x = y \Leftrightarrow b^y = x$

For $x > 0, y > 0, a > 0, a \neq 1$, and any real number r:

$\log_b x^r = r \cdot \log_b x$

$\log_b xy = \log_b x + \log_b y$

$\log_b\left(\frac{x}{y}\right) = \log_b x - \log_b y$

For any positive real numbers x, a, and b, where $a \neq 1$ and $b \neq 1$:

$\log_b x = \frac{\log x}{\log b} = \frac{\ln x}{\ln b} = \frac{\log_a x}{\log_a b}$

www.neiljody.com