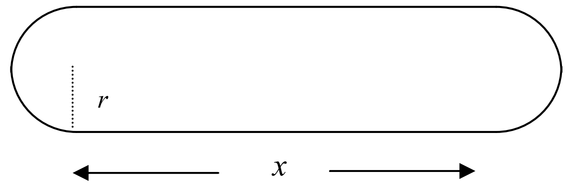
SI Session: April,21st & 23rd, 2009
Tuesdays: 3:30 PM – 5:00 PM
Thursdays: 1:30 PM – 3:00 PM
& 3:30 PM – 5:00 PM
Room 1245 SNAD

Prof. Stockton : Calculus I
Spring 2009
SI Leader : Neil Jody

[1] You are designing an athletic field in the shape of a rectangle x meters long capped at two ends by semicircular regions of radius r. The boundary of the field is to be a 400 meter track. What values of x and r will give the *rectangle* its greatest area?



[2] Find the function f that satisfies the following conditions:

a) $f'(s) = 6s - 8s^3, f(2) = 3$
b) $f''(x) = \sin x$, $f'(0) = 2$, $f(\pi) = -1$

[3] Find the function f with the following properties:

(i) $f''(x) = 6x$ and

(ii) its graph contains the point (2, 9) and has a horizontal tangent there.

[4] On the moon, the acceleration due to gravity is -1.6 meters per second per second. A stone is dropped from a cliff on the moon and hits the surface 20 seconds later. How far did it fall? What was its velocity on impact?

[5] A particle initially at rest, moves along the x-axis such that its acceleration at time $t > 0$ is given by $a(t) = x''(t) = \cos t$. At the time $t = 0$, its position is $x = 3$.

a) Find the velocity and position functions for the particle.
b) Find the values for t for which the particle is at rest.

[6]

a) Find the exact area of the region below the graph of $y = 4 - x^2$, above the x-axis and between the lines $x = -2$ and $x = 1$, by taking the limit of a Riemann sum.

b) Find the exact area of the region below the graph of $y = 2x + 1$, above the x-axis and between the lines $x = 0$ and $x = 3$, by taking the limit of a Riemann sum.

[7] Evaluate each integral.

(a) $\int \frac{2x^2 - x + 3}{\sqrt{x}}\, dx$

(b) $\int \frac{3x}{4+x^2}\,dx$

(c) $\int \frac{3x+6}{\sqrt[3]{x^2+4x-3}}\,dx$

(d) $\int \sec^2\left(\frac{x}{3}\right)\tan^2\left(\frac{x}{3}\right)\,dx$

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

(f) $\int_0^{\pi/3} \sin x\cos^2 x\,dx$

(g) $\int_{-2}^{3} |2x-4|\,dx$

[8] Express $\lim_{\|P\|\to 0}\sum_{i=1}^{n}\left(2c_i\sqrt{(c_i)^2+4}\right)\Delta x_i$ as a definite integral over the interval [1,5] where c_i is any point in the ith subinterval.

[9] Calculate $\frac{dy}{dx}$ if $y=\int_{x^2}^{x^3}\sqrt{1+t^3}\,dt$.