ESP
Kouba
Worksheet 13

1.) True or False.

a.) $\int \frac{1}{1+e^x}\,dx = \ln(1+e^x) + C$

b.) $\int \frac{e^x}{1+e^{2x}}\,dx = \arctan(e^x) + C$

c.) $\int (1+\ln x)\,dx = x\ln x + C$

d.) $\int x^x(1+\ln x)\,dx = x^x + C$

2.) Set up but do not evaluate integrals which represent the total mass of each of the following objects.

a.) A thin rod 20 cm. long has constant density of 3 gm./cm.

b.) A thin rod 20 cm. long has variable density. Its density at a point x cm. from its left end is given by $x/(1+x^2)$ gm./cm.

c.) A hemispherical solid of radius 10 ft. has variable density. At a distance of h ft. from its flat, circular base, the density is given by $h^3 e^{-h}$ kg./ft.^{3}

3.) Let $f(x)$ be the distance from $(0, 0)$ to the point (x, y) on the graph of $y = x^2$. What is the average value of f on the interval $[\,0\,,\,\sqrt{15}\,]$?

4.) Integrate.

a.) $\int \frac{1}{\sqrt{1-x}}\,dx$

b.) $\int \frac{1}{\sqrt{1-x^2}}\,dx$

c.) $\int \frac{1}{\sqrt{x}\,\sqrt{1-x}}\,dx$

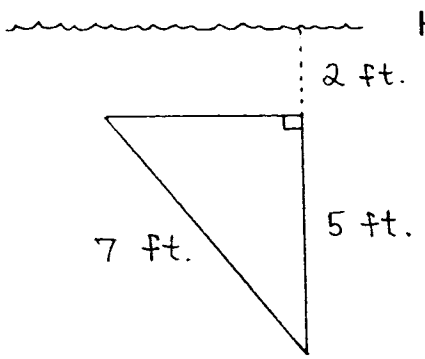
d.) $\int_{-1}^{1} \sqrt{x^2}\,dx$

5.) A "point" mass measuring 200 gm. is moving in a circular path of radius 2 ft., completing 3 revolutions per second. What is the kinetic energy of this moving object ? (Recall : K.E. = 1/2 $m v^2$.)

6.) A flat, circular plate of uniform density has a radius of 2 ft. and a mass of 200 gm. Spinning about it axis of revolution, the plate makes 3 revolutions per second. What is the kinetic energy of this moving object if the axis of revolution passes through

a.) its center ?
b.) a diameter ?

7.)



Find the total force due to water pressure on one side of the submerged, triangular (flat) plate.

8.) A flat 5 ft. x 7 ft. plate is submerged in 10 ft. of water. It rests on its 5 ft. edge. Set up an integral for the total force due to water pressure on one side of the plate if

a.) it rests vertically.
b.) it rests tilted 30 ^{o} from vertical.