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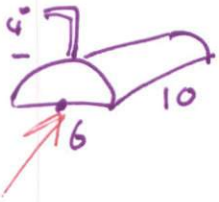
Math 2414 Quiz February 22, 2017 Unsupported answers earn NO credit

Problem 1 (10 points) Name and Section Number

Problem 2 (30 points) SET UP the integral(s) required to find the work done in pumping all of the water out of a tank that is in the shape of a half cylinder lying rectangular face down. The radius is 6 m, the length is 10 m, and the top of the pump is 4 m above the top of the tank.
Indicate your axis.



$x^2+y^2=6^2$

$1000(9.80)\int_0^6 (10-y)(2x)10\,dy$

$9000(9.80)\int_0^6 (10-y)2\sqrt{6^2-y^2}\,10\,dy$

$=(20)(1000)(9.80)\int_0^6 (10-y)\sqrt{6^2-y^2}\,dy$

axis at center of Circle

Problem 3 (40 points) Evaluate the following integral:

$\int \cos^2 x\,dx$

$\cos(2x)=\cos^2x-\sin^2x$

$\int \frac{1+\cos(2x)}{2}\,dx$

$\frac{x}{2}+\frac{\sin(2x)}{4}+C$

Problem 4 (30 points) Evaluate the following:

$\int x\sin x\,dx$

$u=x \quad du=\sin x\,dx$

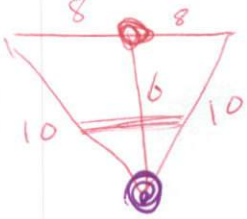
$du=dx \quad v=-\cos x$

$x(-\cos(x))-\int(-\cos x)\,dx$

$-x\cos(x)+\int\cos(x)\,dx$

$-x\cos(x)+\sin(x)+C$

Problem 5 (30 points) SET UP the integral(s) required to find the total hydrostatic force on a dam that is in the shape of an inverted isocoles triangle with base 16 m, and A HEIGHT OF 6 m if the water is to the top of the dam. MARK where you are placing your axis.



$$(9.80)(1000)\int_{-6}^{0}(-y)(2x)\,dy = (9.80)(1000)\int_{-6}^{0}(-y)\left(2\cdot\frac{4}{3}(y+6)\right)dy$$

axis at dot.

$(0,-6)$ $y=\frac{3}{4}x-6$

$(8,0)$ $\frac{4(y+6)}{3}=x$

If axis at vertex at bottom,

$y=\frac{3}{4}x$

$$(9.80)(1000)\int_{0}^{6}(6-y)\left(2\cdot\frac{4}{3}y\right)dy$$

Problem 6 (40 points) Evaluate the following integral:

$$\int \sin^3 x\,dx$$

$$\int \sin(x)\left(1-\cos^2(x)\right)dx$$

$$\int \sin(x)\,dx - \int \sin(x)\cos^2(x)\,dx$$

$u=\cos x$

$du=-\sin x\,dx$

$$-\cos(x)+\frac{\cos^3 x}{3}+C$$