Math 172 - Quiz 8

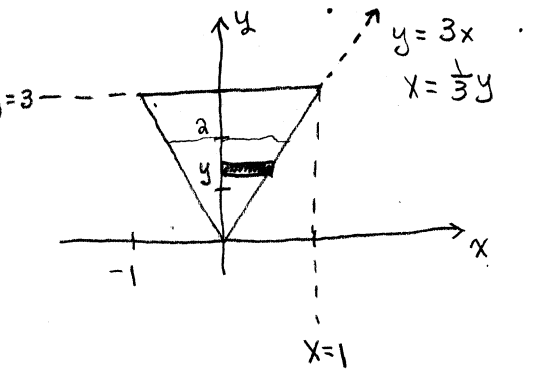
October 25, 2017

Name key

Score _____

Show all work to receive full credit. Supply explanations when necessary.

1. (5 points) A metal plate has the shape of an isosceles triangle with base length 2 feet and altitude 3 feet. The plate will be used as the end of a trough that will hold untreated sewage weighing 97 lbs/ft^3. Find the fluid force on the plate when the sewage in the trough is 2 feet deep. (Use your calculator to evaluate the required integral(s).)



$$\int_0^2 97\,(2-y)(2)\left(\tfrac{1}{3}y\right)dy$$

$$= \frac{194}{3}\int_0^2 (2y-y^2)\,dy = \frac{194}{3}\left(4-\frac{8}{3}\right)$$

$$= \frac{776}{9} \approx \boxed{86.2 \text{ lb}}$$

2. (5 points) Integrate.

(a) $\displaystyle\int \frac{x+4}{x^2+8x+17}\,dx$ $= \frac{1}{2}\int \frac{1}{u}\,du = \frac{1}{2}\ln|u| + C$

$u = x^2+8x+17$

$du = (2x+8)\,dx$

$\frac{1}{2}du = (x+4)\,dx$

$$= \boxed{\frac{1}{2}\ln|x^2+8x+17| + C}$$

(b) $\displaystyle\int \frac{dx}{\underbrace{x^2+8x+17}_{(x+4)^2+1}}$ $= \int \frac{dx}{(x+4)^2+1} = \int \frac{du}{u^2+1}$

$u = x+4$

$du = dx$

$= \tan^{-1}u + C$

$$= \boxed{\tan^{-1}(x+4) + C}$$