Math 1B (9:30am – 10:20am)
Quiz 5 Version 3
Fri May 13, 2011

What month is your birthday ? ___ ___
What are the first 2 digits of your address ? ___ ___
What are the last 2 digits of your zip code ? ___ ___
What are the last 2 digits of your DeAnza ID number ? ___ ___

SCORE: ___ / 30 POINTS

NO CALCULATORS ALLOWED

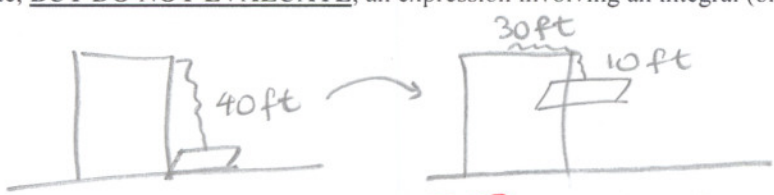
SHOW PROPER ALGEBRAIC WORK
USE PROPER NOTATION & SIMPLIFY ALL ANSWERS WHERE REASONABLE

MULTIPLE CHOICE: CIRCLE THE CORRECT ANSWER **SCORE: ___ / 3 POINTS**

A 5 foot long chain weighing 24 pounds hangs from a hook in the ceiling of an 11 foot tall room. (So, the bottom of the chain is 6 feet from the floor.) How many foot-pounds of work are done lifting the bottom loop of the chain to the ceiling so that it touches the top loop ?
(HINT: Draw "before" and "after" diagrams.)

[a] 25 [b] 10 [c] 20 [d] 30 [e] 15

A 40 foot chain weighing 3 pounds per foot hangs over the edge of a 40 foot tall building. The chain is used to lift a 15 pound tabletop from ground level to a window 30 feet above ground. **SCORE: ___ / 6 POINTS**
Write, **BUT DO NOT EVALUATE**, an expression involving an integral (or sum of integrals) for the work done.



IF $x=0$ IS ROOF AND $x=40$ IS GROUND

$$\frac{(15)(30)}{2} + \int_{10}^{40} 3x\,dx$$

OR

$$\int_{0}^{30} (15 + 3(40-x))\,dx$$

OR IF $x=40$ IS ROOF AND $x=0$ IS GROUND

$$\frac{(15)(30)}{2} + \int_{0}^{30} 3(40-x)\,dx$$

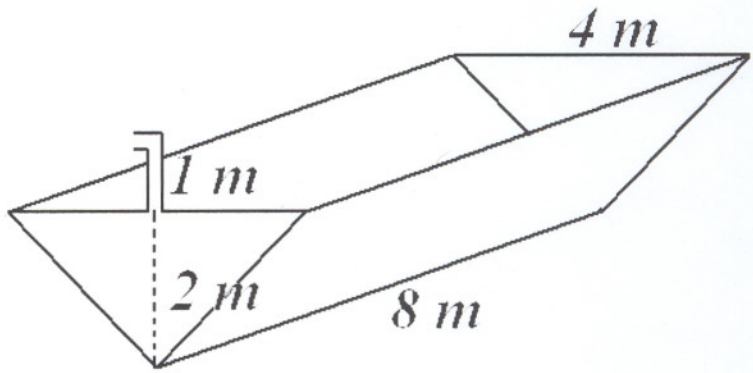
OR

$$\int_{10}^{40} (15 + 3x)\,dx$$

TALK TO ME IF YOU USED ANY OTHER SCALE FOR X

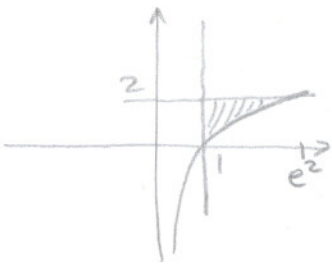
A tank in the shape of the triangular prism shown on the right is filled with water. **SCORE: ___ / 6 POINTS**
Write, **BUT DO NOT EVALUATE**, an integral for the work required to pump the water out of the spout.

SEE 7:30 VERSION 8



The region bounded by $x=1$, $y=\ln x$ and $y=2$ is revolved around the $y-$axis. **SCORE: ___ / 6 POINTS**

Find the volume of the solid.



$y=\ln x$

$x=e^y$

$\frac{1}{2}\int_0^2 \pi((e^y)^2-1^2)\,dy$

$=\int_0^2 \pi(e^{2y}-1)\,dy$

$=\pi\left(\frac{1}{2}e^{2y}-y\right)\Big|_0^2$

$=\pi\left(\frac{1}{2}e^4-2-\frac{1}{2}\right)$

$=\pi\left(\frac{1}{2}e^4-\frac{5}{2}\right)$

$=\frac{\pi}{2}(e^4-5)$ $\frac{1}{2}$

OR

$\frac{1}{2}\int_1^{e^2} 2\pi x(2-\ln x)\,dx$

$=2\pi\int_1^{e^2}(2x-x\ln x)\,dx$

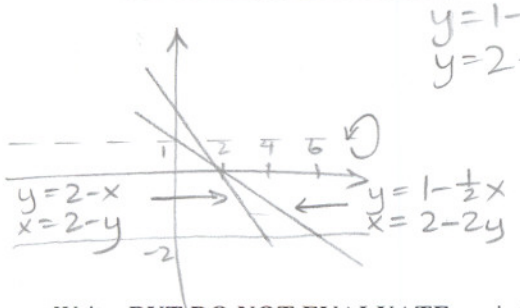
$=2\pi\left(\frac{1}{4}x^2(5-2\ln x)\right)\Big|_1^{e^2}$

$=2\pi\left(\frac{1}{4}e^4-\frac{5}{4}\right)$

$=\frac{\pi}{2}(e^4-5)$ $\frac{1}{2}$

The region bounded by $y=-2$, $y=1-\frac{1}{2}x$ and $y=2-x$ is revolved around the line $y=1$. **SCORE: ___ / 9 POINTS**

[a] Write, **BUT DO NOT EVALUATE**, an integral (or sum of integrals) for the volume of the solid using the shell method.



$y=1-\frac{1}{2}x$ x-INT $(2,0)$ y-INT $(0,1)$ $1-\frac{1}{2}x=-2 \to x=6$

$y=2-x$ x-INT $(2,0)$ y-INT $(0,2)$ $2-x=-2 \to x=4$

$\int_{-2}^{0} 2\pi(1-y)(2-2y-(2-y))\,dy$ $\frac{1}{2}$ $\frac{1}{2}$

$=\int_{-2}^{0} 2\pi(1-y)(-y)\,dy=\int_{-2}^{0} 2\pi(y^2-y)\,dy$

[b] Write, **BUT DO NOT EVALUATE**, an integral (or sum of integrals) for the volume of the solid using the washer method.

$\int_2^4 \pi\left((1-(2-x))^2-(1-(1-\frac{1}{2}x))^2\right)dx+\int_4^6 \pi\left((3^2-(1-(1-\frac{1}{2}x))^2\right)dx$

$=\int_2^4 \pi\left((x-1)^2-\frac{1}{4}x^2\right)dx+\int_4^6 \pi\left(9-\frac{1}{4}x^2\right)dx$

$\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{2}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{2}$ $\frac{1}{4}$ $\frac{1}{4}$

[c] Find the volume of the solid by evaluating the appropriate integral(s) from either [a] or [b].

$\int_{-2}^{0} 2\pi(y^2-y)\,dy$

$=2\pi\left(\frac{1}{3}y^3-\frac{1}{2}y^2\right)\Big|_{-2}^{0}$

$=2\pi\left(0-\left(-\frac{8}{3}-2\right)\right)$

$=\frac{28\pi}{3}$ $\frac{1}{2}$