Math 1B
Group Quiz 8
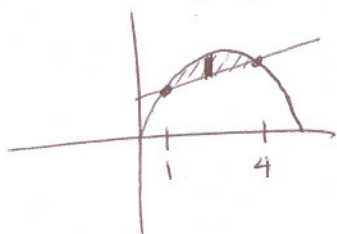**Wed Jun 11, 2008**

Names: _____
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THIS IS A NO CALCULATOR QUIZ

[3 POINTS] Find the volume of the solid generated if the region bounded by $y = 6x - x^2$ and $y = x + 4$ is revolved around the line $x = 0$.

$$\text{SHELL:} \int_1^4 (x-0)(6x - x^2 - (x+4))\,dx \ * \ 2\pi$$

$$= \int_1^4 x(-x^2 + 5x - 4)\,dx \ * \ 2\pi$$

$$= \int_1^4 (-x^3 + 5x^2 - 4x)\,dx \ * \ 2\pi$$

$$= \left(-\frac{x^4}{4} + \frac{5x^3}{3} - 2x^2\right)\Big|_1^4 \ * \ 2\pi$$

$$= \left(-\frac{1}{4}(256-1) + \frac{5}{3}(64-1) - 2(16-1)\right) * 2\pi = \frac{45\pi}{2}$$
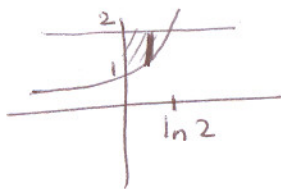
$6x - x^2 = x + 4$
$0 = x^2 - 5x + 4$
$x = 1, 4$

[3 POINTS] Find the volume of the solid generated if the region bounded by $y = 2\ln x$, $y = 0$, $x = 0$ and $y = 2$ is revolved around the line $x = 0$.
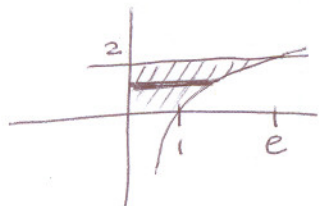
$$\text{DISK:} \int_0^2 (e^{\frac{y}{2}} - 0)^2\,dy \ * \ \pi$$

$$= \int_0^2 e^y\,dy \ * \ \pi$$

$$= e^y\Big|_0^2 \ * \ \pi$$

$$= (e^2 - 1)\pi$$

$y = 2\ln x$
$\frac{y}{2} = \ln x$
$e^{\frac{y}{2}} = x$

[4 POINTS] Find the volume of the solid generated if the region bounded by $y = e^x$, $y = 2$ and $x = 0$ is revolved around the line $x = 0$.

$$\text{SHELL:} \int_0^{\ln 2} (x-0)(2 - e^x)\,dx \ * \ 2\pi$$

$$= \int_0^{\ln 2} (2x - xe^x)\,dx \ * \ 2\pi$$

$$= (x^2 - xe^x + e^x)\Big|_0^{\ln 2} \ * \ 2\pi$$

$$= ((\ln 2)^2 - 2\ln 2 + 2 - 1)\,2\pi$$

$$= 2\pi((\ln 2)^2 - 2\ln 2 + 1)$$

$$\begin{array}{cc} u & dv \\ x & +\, e^x \\ 1 & -\, e^x \\ 0 & +\, e^x \end{array}$$