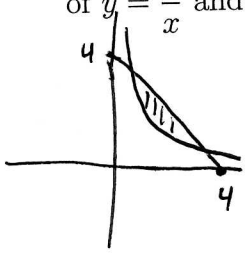
Quiz 1
Math 201 F01

Name: Key

01/25/12

1. Set up and evaluate an integral to compute the area between the graphs of $y = \dfrac{3}{x}$ and $y = 4 - x$.



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

$4x - x^2 = 3$

$x^2 - 4x + 3 = 0$

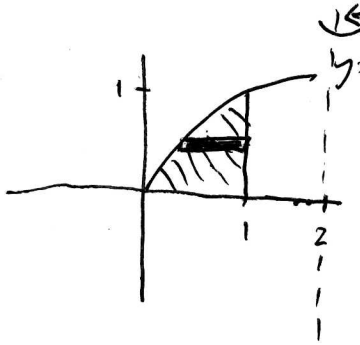
$(x-3)(x-1) = 0$

So points of intersection are $x = 1, 3$

$$A = \int_1^3 \left((4-x) - \frac{3}{x}\right) dx = 4x - \frac{x^2}{2} - 3\ln x \Big|_1^3$$

$$= 12 - \frac{9}{2} - 3\ln 3 - \left(4 - \frac{1}{2} - 0\right) = \boxed{4 - 3\ln 3}$$

2. Set up and evaluate an integral to compute the volume of the solid of revolution obtained by rotating the region bounded by $y = \sqrt{x}$, $y = 0$, and $x = 1$ about the axis $x = 2$.



$y = \sqrt{x}$ or $x = y^2$

$$\text{Volume} \approx \sum_{\text{washers}} \Delta V = \sum \left(\pi(2-y^2)^2 - \pi 1^2\right) \Delta y$$

$$V = \pi \int_0^1 (2-y^2)^2 - 1 \, dy$$

$$= \pi \int_0^1 4 - 4y^2 + y^4 - 1 \, dy$$

$$= \pi \int_0^1 3 - 4y^2 + y^4 \, dy$$

$$= \pi \left(3y - \frac{4}{3}y^3 + \frac{y^5}{5}\right)\Big|_0^1$$

$$= \pi \left(3 - \frac{4}{3} + \frac{1}{5}\right) = \boxed{\pi \frac{28}{15}}$$