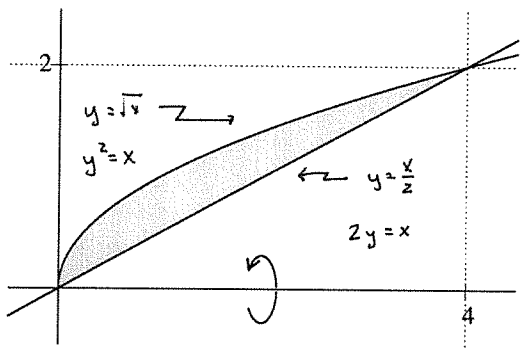
Math 172 | Quiz 3 | Name: _____

3 Feb 2017 | Show Appropriate Work | Point Values in $\boxed{\text{boxes}}$.

1. $\boxed{4}$ The region bounded by the graphs of $y = \sqrt{x}$ and $y = x/2$, the shaded region in the figure, is revolved around the x-axis. Express the volume of the resulting solid as an integral using the Disk Method and the Shell Method. **Do not evaluate either integral.**



(a) $V_{Disk} = \pi \int_0^4 \left[(\sqrt{x})^2 - \left(\frac{x}{2}\right)^2 \right] dx$

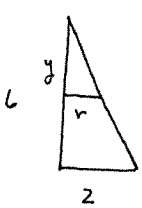
(b) $V_{Shell} = 2\pi \int_0^2 (y)(2y - y^2)\, dy$

2. $\boxed{4}$ A conical tank on the moon is filled with liquid oxygen of density ρ. The gravitational constant on the moon is g. The tank is 6 m tall and has radius 2 m at the base. There is a spout protruding 1 m above the top of the cone. The cone is oriented as shown in the figure below. If the tank is full, express the work required to empty the tank through the spout as an integral. **Do not evaluate the integral.**

$\rho g \pi \int_0^6 \left(\frac{y}{3}\right)^2 (y+1)\, dy$

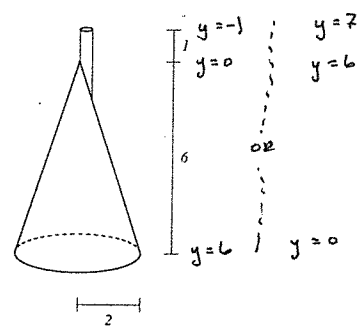
or

$\rho g \pi \int_0^6 \left(\frac{6-y}{3}\right)^2 (7-y)\, dy$



$\frac{r}{y} = \frac{2}{6}$

$r = \frac{1}{3} y$



3. $\boxed{2}$ Integrate $\int x \cos x \, dx$.

$u = x \qquad dv = \cos x \, dx$

$du = dx \qquad v = \sin x$

$\int x \cos x \, dx = x \sin x - \int \sin x \, dx = x \sin x + \cos x + C$