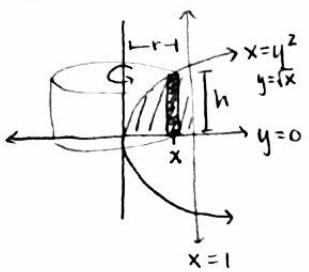
Quiz 4

January 27, 2017

Show all work and circle your final answer.

1. Set up, but **do not evaluate**, an integral to find the volume obtained by rotating the region bounded by $y = 0$, $x = y^2$, and $x = 1$ about the y-axis using:

   (a) cylindrical shells



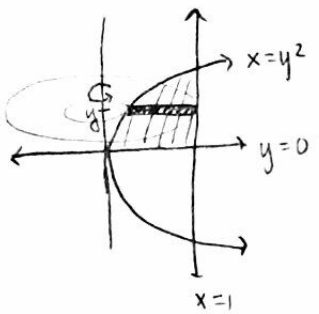
$r = x$

$h = \sqrt{x}$

$$\boxed{V = \int_0^1 2\pi x\sqrt{x}\, dx}$$

Note: If you chose the region under the x-axis, you should get the same integral.

   (b) disks/washers



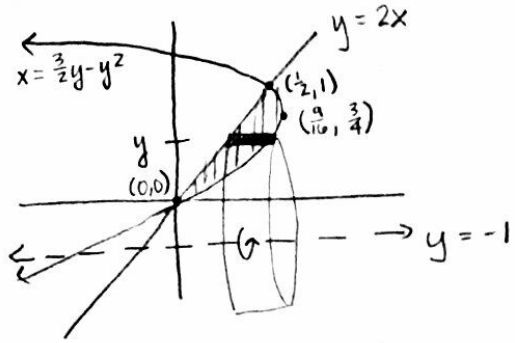
$R = 1$

$r = y^2$

$$\boxed{V = \int_0^1 \pi\left(1^2 - (y^2)^2\right) dy}$$

Both of these integrals give the same answer, $V = \frac{4\pi}{5}$

2. Set up, but **do not evaluate,** an integral that represents the volume of the solid of revolution obtained by revolving the area bounded by $y = 2x$ and $x = \frac{3}{2}y - y^2$ about the line $y = -1$. (Use whichever method works best.)



INTERSECT:

$\frac{1}{2}y = \frac{3}{2}y - y^2$

$y^2 - y = 0$

$y(y-1) = 0$

$y = 0, 1$

Use shells, otherwise we need to split the region into 2 parts

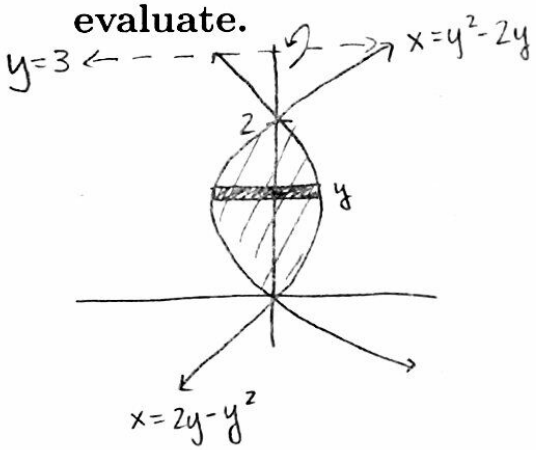
$r = y + 1$

$h = \frac{3}{2}y - y^2 - \frac{1}{2}y$

$= y - y^2$

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

3. Use the method of cylindrical shells to set up an integral to find the volume obtained by rotating the region bounded by $x = y^2 - 2y$ and $x = 2y - y^2$ about the line $y = 3$. **Do not evaluate.**



$r = 3 - y$

$h = (2y - y^2) - (y^2 - 2y)$

$= 4y - 2y^2$

$$V = 2\pi \int_0^2 (3-y)(4y-2y^2)\,dy$$