$SOLUTIONS$

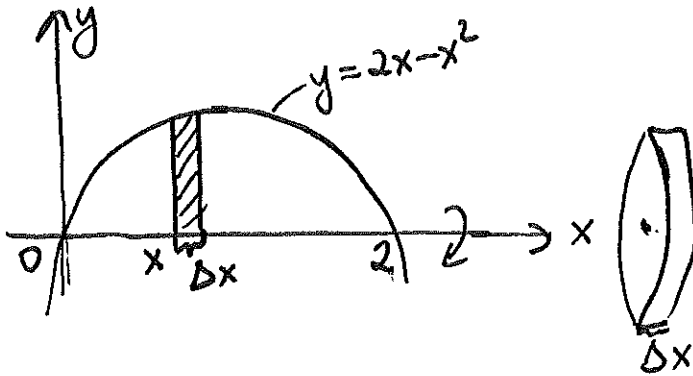## MATH 101-007 Quiz 8

Let R be the region in the plane bounded by the parabola $y = 2x - x^2$, and the x-axis. Assume R is revolved about the x-axis. Let V be the volume of the solid generated.

a) Express V as an integral using the disk method. Do not evaluate.

Disk radius $= 2x - x^2$.

$$\Delta V \approx \pi (2x - x^2)^2 \Delta x.$$

$$V = \int_0^2 \pi (2x - x^2)^2 \, dx.$$

b) Express V as an integral using the cylindrical shell method. Do not evaluate.

$h(y) = x_2 - x_1$

shell radius $= y$

shell height $=$
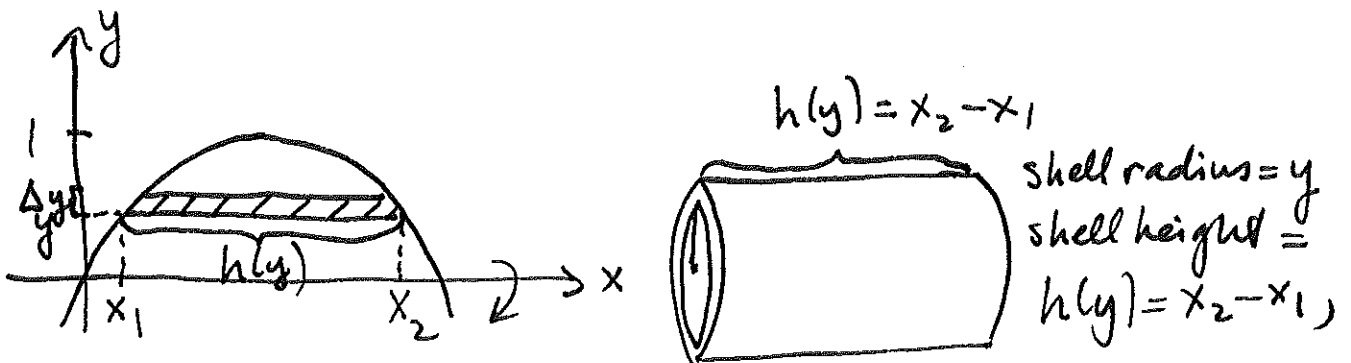
$h(y) = x_2 - x_1$)

x_1, x_2 are the solutions of $y = 2x - x^2$, with $x_1 < x_2$.

$$y = 2x - x^2 \implies x^2 - 2x + y = 0 \implies x = \frac{2 \mp \sqrt{4 - 4y}}{2} = 1 \mp \sqrt{1 - y}.$$

$$x_1 = 1 - \sqrt{1-y}, \quad x_2 = 1 + \sqrt{1-y} \implies h(y) = x_2 - x_1 = 2\sqrt{1-y}. \text{ Then}$$

$$\Delta V \approx 2\pi y \cdot 2\sqrt{1-y}\, \Delta y \implies$$

$$V = \int_0^1 2\pi y \, 2\sqrt{1-y}\, dy = 4\pi \int_0^1 y \sqrt{1-y}\, dy.$$