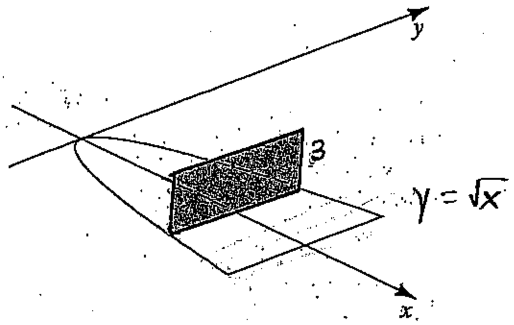
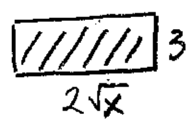
Name: Key Section: ________________

1. Let R be the region bounded by the graphs of $x = y^2$ and $x = 4$. **Set up** an integral that can be used to find the **volume** of the solid that has R as its base if every cross section by a plane perpendicular to the x-axis is a rectangle of height 3. (**Note:** You do not need to evaluate the integral.)





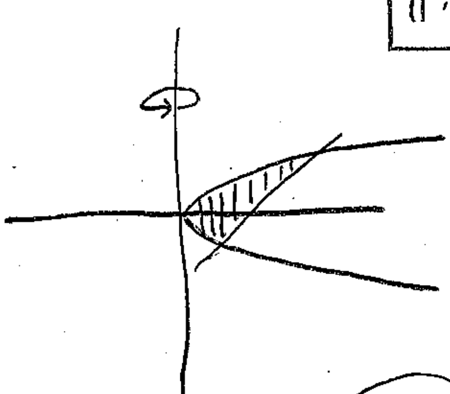
Do in terms of x since cross sections are perp. to the x-axis.

$A(x) = b \cdot h = 6\sqrt{x}$

$\int_0^4 6\sqrt{x}\,dx$

2. Sketch the region R bounded by the graphs of the equations $x = 2y^2$, and $x = 4 + 2y$. Find the **volume** of the solid generated if R is revolved around the y-**axis**. (You may find it helpful to draw an arbitrary "washer".)

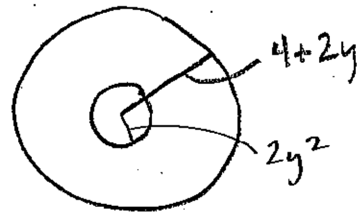
$\boxed{\pi \cdot 57\tfrac{3}{5}}$



$2y^2 = 4 + 2y \Rightarrow 2y^2 - 2y - 4 = 0$

$\Rightarrow y^2 - y - 2 = 0$

$y = \dfrac{1 \pm \sqrt{1-(-8)}}{2} = \dfrac{1 \pm 3}{2} = 2, -1$



$\int_{-1}^{2} \pi\left((4+2y)^2 - (2y^2)^2\right)dy$

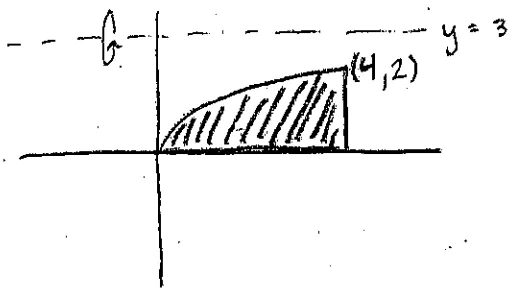
$= \pi \int_{-1}^{2} (16 + 16y + 4y^2 - 4y^4)\,dy$

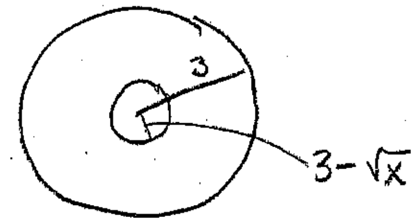
$= \pi \left[16y + 8y^2 + \frac{4}{3}y^3 - \frac{4}{5}y^5\right]_{-1}^{2}$

$= \pi\left[32 + 32 + \frac{32}{3} - \frac{4 \cdot 32}{5} - (-16 + 8 - \frac{4}{3} + \frac{4}{5})\right]$

$= \pi\left(72 + \frac{36}{3} - \frac{132}{5}\right) = \pi\left(84 - 26\tfrac{2}{5}\right)$

3. Find the **volume** of the solid of revolution created by rotating the region R bounded by $y = \sqrt{x}$, $x = 4$ and $y = 0$ about the line $y = 3$. (You may find it helpful to sketch the region R and draw and arbitrary "washer".)





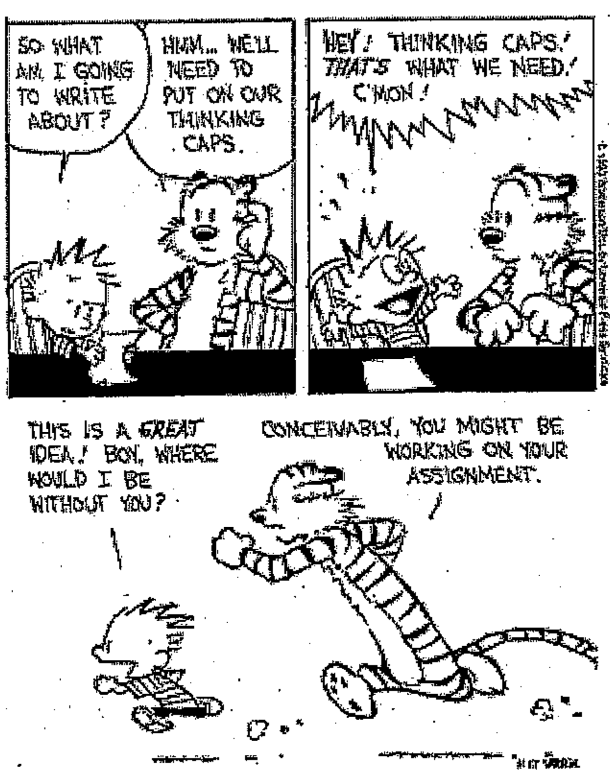
$$\int_0^4 \pi\left(3^2 - (3-\sqrt{x})^2\right)dx$$

$$= \pi\int_0^4 \left(9 - (9 - 6\sqrt{x} + x)\right)dx$$

$$= \pi\int_0^4 (6\sqrt{x} - x)\,dx$$

$$= \pi\left[6\cdot\tfrac{2}{3}x^{3/2} - \tfrac{1}{2}x^2\right]_0^4$$

$$= \pi(4\cdot 8 - 8) = \pi\cdot 24$$



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