Name: _____   _____ / 25

30 minutes maximum. 25 possible points. No aids (book, calculator, etc.) are permitted Show all work and use proper notation for full credit. Answers should be in reasonably-simplified form.

1. **[8 points]** Let R be the region bounded by $y = 6x - 3x^2$. Use the Method of Cylindrical Shells to find the volume of the solid obtain by rotating R about the y-axis. (Hint: Sketch R. Sketch a sample slice of R.)

2. **[4 points]** Let R be the region bounded by $x = \sqrt{y} + 1$, $x = 1$, and $x = 3$. Use the Method of Cylindrical Shells to **set up but do not evaluate** an integral to find the volume of the solid obtain by rotating R about the x-axis.

Formulas: arc length $= \int_a^b \sqrt{1+(f'(x))^2}\,dx$ surface area $= \int_a^b 2\pi f(x)\sqrt{1+(f'(x))^2}\,dx$

3. [4 points] **Set up but do not evaluate** an integral for the length of the curve $y = \sin(x)$ from $x = 0$ to $x = \pi$.

4. [5 points] Find the surface area generated by revolving the curve $y = \frac{1}{3}x^3$ between $x = 1$ to $x = 2$ about the x-axis. (Yes. You can evaluate this integral!)

5. [3 points] Evaluate the indefinite integral $\int \sqrt{y}\sqrt{1 + \frac{1}{4y}}\,dy$.