Math 166 - Section A
February 1, 2008

Name: Key - Pink

Quiz #3b: Sections 5.3 & 5.4
Show all work in a neat and logical manner in order to get full credit.

10 pts. 1. Set-up the integral to find the length of the curve $x = \frac{2}{3}t^3$, $y = 3t^2$ on $0 \leq t \leq 6$. Simplify your answer, so that the integration will be easy. You do not have to evaluate the integral.

$$L = \int_a^b \sqrt{(x')^2 + (y')^2}\, dt$$

$$x = \frac{2}{3}t^3 \qquad y = 3t^2$$

$$x' = 2t^2 \qquad y' = 6t$$

$$L = \int_0^6 \sqrt{(2t^2)^2 + (6t)^2}\, dt$$

$$L = \int_0^6 \sqrt{4t^4 + 36t^2}\, dt$$

$$L = \int_0^6 \sqrt{4t^2}\sqrt{t^2 + 9}\, dt$$

$$L = \int_0^6 2t\sqrt{t^2 + 9}\, dt$$

Don't forget the back! ⇒

10 pts.

2. Find the lateral (side) surface area of the cone generated by revolving the line segment $y = \frac{1}{4}x$, $0 \leq x \leq 4$, about the x-axis. (Include a graph and round your answer to the nearest tenth.)

$$A = 2\pi \int_a^b g(t)\sqrt{[f'(t)]^2 + [g'(t)]^2}\, dt$$

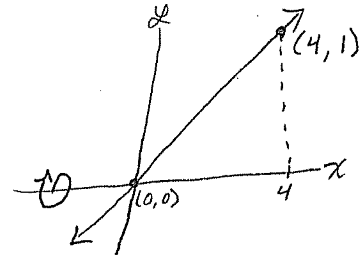
$$A = 2\pi \int_0^4 \frac{1}{4}x \sqrt{1 + \left(\frac{1}{4}\right)^2}\, dx$$

$$= \frac{4\pi}{2}\sqrt{\frac{17}{16}} \int_0^4 x\, dx$$

$$= \frac{\pi}{8}\sqrt{17}\left(\frac{x^2}{2}\right)_0^4$$

$$= 4\pi\sqrt{17}$$

$$\approx 13$$



10 pts.

3. Use the shell method to find the volume of the solid generated when the region bounded by the given curves is revolved about the line $x = 3$.

$$y = 18 - 2x^2 \quad (x \geq 0), \quad x = 0, \quad y = 0$$

(Include a graph and find an exact answer using π, if needed.)

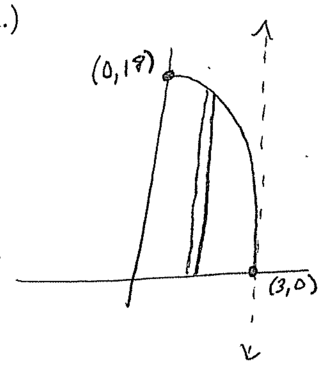
Shell Method: $2\pi \int_a^b r \cdot h\, dr$

$$V = 2\pi \int_0^3 (3-x)(18-2x^2)\, dx$$

$$= 2\pi \int_0^3 54 - 18x - 6x^2 + 2x^3\, dx$$

$$= 2\pi \left(54x - 9x^2 - 2x^3 + \frac{x^4}{2}\right)_0^3$$

$$= 135\pi$$



Points earned: ____________ **out of a possible 30 points**