Math 152 - Fall 2013 - Quiz #3 **Score:** ________ out of 10.

Name: Key

Show all work clearly and in order. Please box your answers.

1. **Set up but do not evaluate the integral** for the exact arc length of the curve $y = \sin^2(3x) + 4$ from $x = \pi/2$ to $x = \pi$.

$$y = \sin^2(3x) + 4 = (\sin(3x))^2 + 4$$
$$y' = 2\sin(3x) \cdot \frac{d}{dx}(\sin(3x))$$
$$= 2\sin(3x)\cos(3x)\frac{d}{dx}(3x)$$
$$= 2\sin(3x)\cos(3x) \cdot 3$$
$$= 6\sin(3x)\cos(3x)$$

$$\text{Length} = \int_a^b \sqrt{1 + [y']^2}\, dx$$

$$\text{Length} = \boxed{\int_{\pi/2}^{\pi} \sqrt{1 + [6\sin(3x)\cos(3x)]^2}\, dx}$$

2. **Set up but do not evaluate the integral** for the area of the surface generated by revolving $y = \sqrt{4 - x^2}$ about the $x$-axis from $x = -1$ to $x = 1$.

$$y = (4 - x^2)^{1/2}$$
$$y' = \frac{1}{2}(4 - x^2)^{-1/2}\frac{d}{dx}(4 - x^2)$$
$$= \frac{1}{2}(4 - x^2)^{-1/2}(-2x)$$

$$\text{surface area} = \int_a^b 2\pi y\sqrt{1 + [y']^2}\, dx$$
$$= \boxed{\int_{-1}^{1} 2\pi\sqrt{4 - x^2}\sqrt{1 + \left[\frac{1}{2}(4 - x^2)^{-1/2}(-2x)\right]^2}\, dx}$$