NAME: _____ **Panther ID:** _____

Take-home Quiz 3 - Due Thu. Feb. 25 MAC 2313, Spring 2010

To receive credit you MUST SHOW ALL YOUR WORK. Answers which are not supported by work will not be considered.

1. (6 pts) Consider a right circular cylinder with radius of the base r and height h. It is known that measurements of r and h can have each a 1% possible percentage error. Use differentials to estimate the percentage error in measuring the volume.

2. (6 pts) Show that $f(x, y) = \arctan(\frac{y}{x})$ satisfies the Laplace equation $\frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} = 0$.

3. (8 pts) Suppose that $w = f(x, y), x = r\cos\theta$, and $y = r\sin\theta$. Show that

$$\left(\frac{\partial w}{\partial x}\right)^2 + \left(\frac{\partial w}{\partial y}\right)^2 = \left(\frac{\partial w}{\partial r}\right)^2 + \frac{1}{r^2}\left(\frac{\partial w}{\partial \theta}\right)^2.$$

Hint: Use chain rule to find $\frac{\partial w}{\partial r}$, $\frac{\partial w}{\partial \theta}$ in terms of $\frac{\partial w}{\partial x}$, $\frac{\partial w}{\partial y}$.