Name: _____   Section: _____

MA 114 QUIZ #4
October 2, 2014

The following quiz is worth 4 points. Be sure to read the problem carefully and answer every part of the problem. Be sure to show all of your work. Answers without support will not receive any credit.

1. Find the Maclaurin series for $f(x) = \frac{x}{1-2x}$ and find the interval for which it is valid.

   We know the Maclaurin series for $\frac{1}{1-x}$ is $\displaystyle\sum_{n=0}^{\infty} x^n$. Substituting we get

$$\frac{1}{1-(2x)} = \sum_{n=0}^{\infty} (2x)^n$$

   so

$$\frac{1}{1-2x} = \sum_{n=0}^{\infty} 2^n x^n.$$

   Then multiplying by x we get

$$\frac{x}{1-2x} = \sum_{n=0}^{\infty} 2^n x^{n+1}.$$

   Since $\frac{1}{1-x}$ is valid for $|x| < 1$ and we are replacing x with $2x$, we know our expansion is valid for $|2x| < 1$, and so it is valid on $(-\frac{1}{2}, \frac{1}{2})$.

   One point for correctly modifying the series for $\frac{1}{1-x}$. One point for finding the interval.

2. Let V be the volume of a cylinder with height 10 and base with radius 2. Compute V using an integral.

   Recall that the volume of a solid body is given by

$$\int_a^b A(y)dy$$

   where $A(y)$ is the cross sectional area of the object at height y. For a cylinder the area is constant, and so $A(y) = \pi(2)^2 = 4\pi$. So

$$V = \int_0^{10} 4\pi dy = 4\pi y \big|_0^{10} = 40\pi.$$

   One point for recognizing that he area is constant. One point for integrating.