Name: _____ Section: _____

MA 114 — Calculus II *Spring 2015*

Quiz # 9 — 04/09/15

Answer all questions in a clear and concise manner. Answers that are without explanations or are poorly presented may not receive full credit.

1. Consider the lamina of constant density $\rho = 3$ g/cm^2 occupying the region beneath the graph of $y = \frac{1}{1+x^2}$ for $0 \leq x \leq 2$ and above the x-axis. Calculate M_y, the y-moment of the lamina.

$$M_y = \rho \int_0^2 x(f(x))dx = 3\int_0^2 x \cdot \frac{1}{1+x^2}dx = 3\int_0^2 \frac{x}{1+x^2}dx$$

$$\frac{3}{2}\ln(1+x^2)\Big|_0^2 = \frac{3}{2}\ln 5$$

Award 1 point for using the correct formula, and 1 point for the correct calculation.

2. Use separation of variables to solve the differential equation

$$y' = 2xy^2.$$

$$\begin{aligned} \frac{\mathrm{d}y}{\mathrm{d}x} &= 2xy^2 \\ \int \frac{\mathrm{d}y}{y^2} &= \int 2x\mathrm{d}x \\ -\frac{1}{y} &= x^2 + C \\ y &= -\frac{1}{x^2+C} \end{aligned}$$

Award one point for setting up the correct integral, and one point for the correct solution (location of the constant C is important).