Mathematics 1101Y – Calculus I: Functions and calculus of one variable
TRENT UNIVERSITY, 2011–2012

MATH 1101Y Test 2
30 January, 2012
Time: 50 minutes

Instructions
- *Show all your work.* Legibly, please!
- *If you have a question, ask it!*
- Use the back sides of the test sheets for rough work or extra space.
- You may use a calculator and an aid sheet.

1. Compute any *three* (3) of the integrals **a–f**. *[12 = 3 × 4 each]*

   a. $\displaystyle\int_0^1 \left(1 - z^{16}\right) dz$ **b.** $\displaystyle\int \frac{e^w + e^{-w}}{2}\, dw$ **c.** $\displaystyle\int_1^e 4x\ln(x)\, dx$

   d. $\displaystyle\int \frac{\sec^2\left(\sqrt{x}\right)}{2\sqrt{x}}\, dx$ **e.** $\displaystyle\int_0^{\pi/4} \cos^2(t)\, dt$ **f.** $\displaystyle\int \frac{1}{\sqrt{9 - x^2}}\, dx$

2. Do any *two* (2) of **a–c**. *[10 = 2 × 5 each]*

a. Sketch the region between $y = \sin(\pi x)$ and $y = -1$, for $0 \le x \le 1$, and find its area.

b. Find the maximum area of a rectangle whose border has total length 36.

c. Use the Right-Hand Rule to compute $\displaystyle\int_0^1 (2x + 1)\, dx$.

3. Do *one* (1) of **a** or **b**. *[8]*

a. A smooth horizontal floor meets a smooth vertical floor at a right angle, and a ladder 5 m long is set with its base on the floor and its top against the wall and begins to slide down. At the instant that the top of the ladder is 3 m above the floor, the top is moving down at 2 m/s. How is the distance between the base of the ladder and the wall changing at this instant?

b. Sketch the solid obtained by revolving the region below $x + y = 1$ and above $y = 0$ for $0 \le x \le 1$ about the y-axis, and find its volume.

4. Find the domain and any (and all!) intercepts, vertical and horizontal asymptotes, local maxima and minima, and points of inflection of $f(x) = xe^{-x}$, and sketch its graph. *[10]*

[Total = 40]