Exam I
MATH 155 Section 08
October 8th, 2015. 7:35PM–9:25PM

Your name:

Instructions: Please clearly write your name above. This exam is closed-book and closed-note. You cannot use any electronic device in this exam. You are not allowed to talk to other students. Write all details explicitly. Answers without justifications and/or calculation steps may receive no score. Hand-in both the exam sheet and your work on given sheets.

Total 100 points. 10 points each.

1. Let R be the region bounded by the x-axis, y-axis, and the function $y = \cos x$. Find the volume of the solid generated when R is revolved about the x-axis. (Hint: $\cos^2 x = \frac{1}{2}(1 + \cos 2x)$)

2. Find the arc length of the curve given by the function $y = \frac{(x^2+2)^{\frac{3}{2}}}{3}$ on $[0, 1]$ by integrating with respect to x.

3. For the function $y = \sqrt{4x + 6}$ on $[0, 5]$, find the area of the surface of revolution obtained by revolving the graph about x-axis.

4. How much work is needed to pump all water out of a cylindrical tank with a height of 10 m and radius of 5 m. The water is pumped to an outflow pipe 15 m above the bottom of the tank. Use the density of water ρ, the gravitational acceleration g as given constants.

5. For the function $f(x) = -x^2 + 8$, find the slope of the tangent line on the point $(7, 1)$ of f^{-1}.

6. Evaluate the following integral:

$$\int_0^{\frac{\pi}{2}} \frac{\sin x}{1 + \cos x} dx.$$

7. Calculate the following integral:
$$\int \frac{1}{16x^2 + 1} dx.$$

8. Evaluate the limit:
$$\lim_{x \to 0^+} x^x$$

9. Calculate the following integral:
$$\int \frac{\sin x + \tan x}{\cos^2 x} dx.$$

10. Calculate the following integral:
$$\int e^{2x} \cos x dx.$$