Test 2 **Calculus II** **March 19, 2019**

MATH 129 **Dr. Abdul-Rahman**

Name: _____ **Signature:** _____

Show all your work!

1. [40 points] Decide whether the following improper integrals convergent or divergent, set up the inequalities that prove your answer.

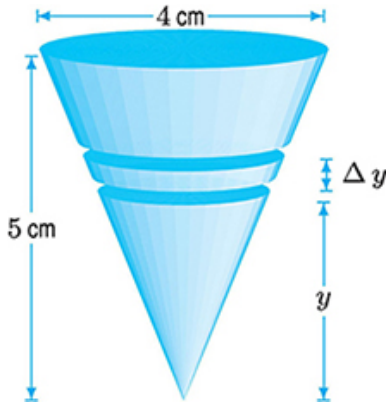
   (a) $\displaystyle\int_{10}^{\infty} \frac{1}{\ln z - 10}\, dz$

   (b) $\displaystyle\int_{1}^{\infty} \frac{2+\cos\theta}{\theta^2} d\theta$

   (c) $\displaystyle\int_{0}^{\infty} \frac{dt}{e^t + t}$

   (d) $\displaystyle\int_{1}^{\infty} \frac{1}{x^{\sqrt{2}} + 1}\, dx$

2. [20 points] Set up a definite integral representing the volume of the cone in the figure, using the slice shown. (do not evaluate the integral).



3. [30 points] Consider the region bounded by $y = 4 - x^2$, $y = 0$, $x = 1$, and $x = 2$. Draw cross sections and set up definite integrals to find the volume of the following solids obtained by rotating the region: (Do not evaluate the integrals).

   (a) about the x-axis.

   (b) about the line $x = -1$.

   (c) abound the line $y = -2$.

4. [30 points] Find the volume of the solid whose base is the region in the xy-plane bounded by the curve $y = x^2$ and the line $y = 1$, and whose cross-section perpendicular to the x-axis are

   (a) squares.

   (b) semi-circles.

   (c) equilateral triangles.

5. [15 points] The density of oil in a circular oil slick on the surface of the ocean at a distance r meters from the center of the slick is given by $\delta(r) = 50/(1+r)\ kg/m^2$. Given that the radius of the slick is $10,000\ m$, use slicing to set up a definite integral that finds the exact mass of oil in the slick.

6. [20 points] A gas station stores its gasoline in a tank under the ground. The tank is a cylinder lying horizontally on its side. (In other words, the tank is not standing vertically on one of its flat ends.) If the radius of the cylinder is 4 feet, its length is 12 feet, and its top is 10 feet under the ground, find the total amount of work needed to pump the gasoline out of the tank. (Gasoline weighs 42 lb/ft^3.) (use slicing and show all of your work).