Test 2 S II, 2011 Name:_____

MAT 162 Gurganus

Directions: Show all work for partial credit purposes. You may use a graphing calculator. The test is closed book.

1. Use Euler's Method to approximate y(2.2) given $\frac{dy}{dx} = 5x - 3y$, and y(2) = 1. Use a stepsize of 0.1 .

2. A. Find the equilibrium solutions to $\frac{dy}{dx} = (y - 2)(y - 3)^2$.

   B. On a single graph,sketch three solutions to $\frac{dy}{dx} = (y - 2)(y - 3)^2$ for the three differential initial conditions: y(0) = 1 , 2.5, and 4.

3. Find y(x), the solution to $\frac{dy}{dx} = x^{-1}y+x$, $y(1) = 3$.

4. Find y(x), the solution to $\frac{dy}{dx} = x^{2}(\cos y)^{2}$, $y(0) = \pi/4$.

5. A tank is filled with 300 liters of contaminated water containing 3 kg of toxins. Pure water is pumped in at a rate of 40 l/min., mixes instantaneously, and then is pumped out at the same rate. Find y(t) the number of grams of the toxin in the tank t minutes after the rinse begins. Then find the time at which there is .01 kg of toxin present.

6. First find the solution to $\frac{d^4}{} - 4\frac{}{} - 21y = 0$, $y(0) = 1$, $y'(0) = 2$.

7. Find the value of k so that $f(x) = x^{-10} + kx^{-11}$ is a probability density function on $[1,+\infty)$ and then find the value of the mean for the probability density function.

8. For $f(x) = 17+ 6x^{1.5}$, find the length of the curve $y = f(x)$ from $x = 2$ to 8.

9. Find the area of the surface generated by rotating about the x-axis the graph of $y = \cos(x)$ from 0 to $\pi/4$.

10. Let A be the region bounded by $y = x+4$ and $y = 16-x^2$. Suppose A has a uniform mass density ρ. Find the moment about the x-axis and the moment about the y-axis.