MA 114 Quiz 10 November 21, 2019

Answer all questions and show your work. Unsupported answers may receive *no credit*. You may not use a calculator on this quiz. Allow 15 minutes for the quiz.

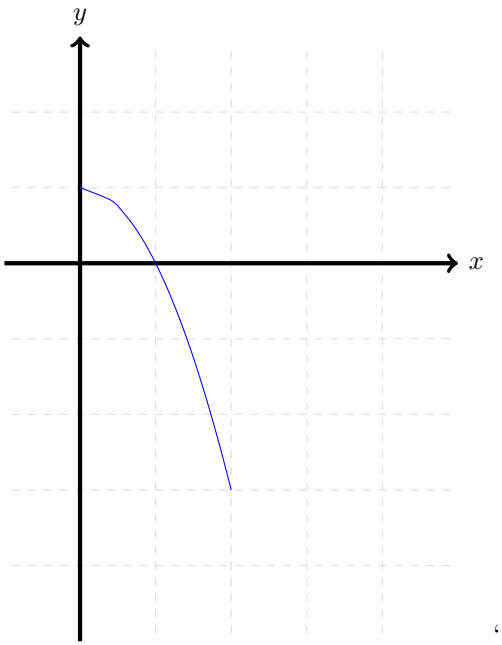
Name: _____ Section: _____

1. (a) (5 points) Find the center of mass of the region bounded by the curves $y = e^x$, $y = 0$, $x = 0$ and $x = 1$. (Assume constant density.)

Solution:

$$A = \int_0^1 e^x = e^1 - e^0 = e - 1$$
$$\overline{x} = \frac{1}{A}\int_0^1 xe^x dx = \frac{1}{e-1}e^x(x-1)\Big|_0^1 = \frac{1}{e-1}$$
$$\overline{y} = \frac{1}{A}\int_0^1 \frac{1}{2}(e^x)^2 dx = \frac{1}{e-1}\frac{1}{2}e^{2x}\frac{1}{2}\Big|_0^1 = \frac{1}{4}\frac{e^2-1}{e-1}$$

(b) (5 points) Graph $x = \sqrt{t}$ and $y = 1 - t$ for $t \in [0, 4]$. Find the derivative at $t = 1$.



Solution: $\frac{dx}{dt} = \frac{1}{2}t^{\frac{-1}{2}}$ and $\frac{dy}{dt} = -1$ so $\frac{dy}{dx} = \frac{-1}{2\sqrt{t}}$ and at 1 this is $\frac{-1}{2}$.