# Tutorial 4

## Question 1

Find the equation of the tangent line to the curve $x = 3e^{t}, y = 5e^{-t} \ \ at \ \ t = 0$ .

## Question 2

Find the graph of the polar equation $r = 4cos\theta - 5sin\theta$ .

## Question 3

Find the area of the surface generated by revolving the parametric curve

$$x = \frac{1}{2}t^2 \quad \text{and} \quad y = \frac{1}{3}(2t+1)^{3/2}, \qquad 0 \le t \le 1.$$

about the y-axis.

## Question 4

Find the slope of the line that is tangent to the polar curve

$$r = 3\sin\theta$$

at $\theta = \dfrac{\pi}{2}$.

## Question 5

Find the area of the surface generated by revolving the parametric curve

$$x = e^t - t \quad \text{and} \quad y = 4e^{t/2}, \qquad 0 \leq t \leq 1.$$

about the x-axis.

## Question 6

Find the slope and the equation of the tangent line to the graph of the polar curve

$$r = e^{2\theta}$$

at $\theta = 0$.

**Question 7**

Find the arc length of the polar curve $r = e^{\theta}$ from $\theta = 0$ to $\theta = \ln 2$.

**Question 8**

Consider the curve given by

$$x^{2/3} + y^{2/3} = 4, \qquad 1 \leq x \leq 8.$$

(a) Find the arclength of the curve.
(b) Find the area of the surface obtained by rotating the curve about the x-axis.

Hint: Use implicit differentiation to find $\dfrac{dy}{dx}$.

## Question 9

Find the area of the surface obtained by rotating the graph of

$$f(x) = 2\sqrt{x+1}\ , \qquad 0 \leq x \leq 1$$

about the x-axis.