Exponential Derivatives

1. For each f defined below, find $f'(x)$.

$$f(x) = x^4 + 2e^x \qquad\qquad f(x) = e^{x+4} - 7e^2 \qquad\qquad f(x) = \frac{e^x + 7}{e}$$

2. Consider $\alpha(x) = x^4 + 2e^x$.

   (a) Find the equation of the line tangent to the graph of α at the point $(0, 2)$.

   (b) Find the line normal the the line you found in part (a) that also passes through the point $(0, 2)$.

3. At what point on the curve of $y = 1 + 2e^x - 3x$ is the tangent line parallel to the line $3x - y = 5$?

Trigonometric Derivatives

1. For each f defined below, find $f'(x)$.

$$f(x) = \sin(x) + 2e^x \qquad f(x) = 5\cos(x) - \tan(x) \qquad f(\theta) = \frac{\cos(\theta) + 7}{\sin(\theta)}$$

2. For the limits below (if they exist).

$$\lim_{\theta \to 0} \frac{\sin(6\theta)}{2\theta} \qquad \lim_{x \to 0} \frac{\sin(3x)\sin(5x)}{x^2} \qquad \lim_{\theta \to 0} \frac{\cos(\theta) - 1}{\sin(\theta)}$$

3. Find an equation of the line tangent to $y = 3x + 6\cos(x)$ at the point $\left(\frac{\pi}{3}, \pi + 3\right)$.