Question 1: Determine the following limits. If a limit does not exist because it is ∞ or $-\infty$, state which with an explanation of your reasoning.

(a)[3] $\displaystyle\lim_{x\to -3^+} \frac{-2}{3+x}$

(b)[3] $\displaystyle\lim_{x\to\infty} \frac{3-2x-2x^3}{7+x^2-5x^3}$

(b)[4] $\displaystyle\lim_{x\to 4^-} \frac{x+4}{x^2-16}$

Question 2: Determine the derivative of each of the following functions. (It is not necessary to simplify your final answers):

(a)[3] $y = (x^3 + 7x^2)(x^3 - x^2 + 5)$

(b)[3] $f(x) = x\sqrt{x} + \dfrac{x^2}{2}$

(c)[4] $g(x) = \dfrac{x^2 + 6}{\sqrt{x^2 + 5}}$

Question 3: Determine the derivative of each of the following functions. (It is not necessary to simplify your final answers):

(a)[3] $y = \dfrac{3}{(3x^2 - x)^{2/3}}$

(b)[3] $f(x) = 3x^4 e^{-x}$

(c)[4] $g(x) = \dfrac{(x + e^{2x})^2}{3x}$

Question 4:

(a)[5] Determine an equation of the tangent line to the graph of $y = (x+3)^3$ at the point where $x = -1$.

(b)[5] Suppose m employees produce $q = \dfrac{200m - m^2}{20}$ units of product per day, and that the demand equation for the product is $p = -0.1q + 70$ where p is price in dollars and q is the number of units. Determine the marginal revenue product when $m = 40$. State units with your answer.

Question 5:

(a)[5] Suppose the average cost of producing q units of a product is

$$\bar{c} = \frac{850}{q} + 4000\frac{e^{(2q+6)/800}}{q}$$

Determine the marginal cost when $q = 97$.

(b)[5] The demand equation for a product is $p = -0.1q + 500$. At what production level q is marginal revenue zero?