

MATH 211, MAJOR EXAM I

Q1)(10 marks) A manufacturer sells a certain product for \$250 per unit. Total cost consists of a fixed

overhead of \$8600 plus production costs of \$90 per unit.

(1) How many units must the manufacturer sell to break even?

(2) What is the manufacturer's profit or loss if 150 units are sold?

(3) How many units must be sold for the manufacturer to realize a profit of \$1,250 ?

Q2)(10 marks) (a) Find the domain of $f(x) = \frac{x}{x^2 - x - 6}$.

(b) Find the equation of the straight line passing through the points $P(1, 4)$ and $Q(-1, 6)$.

Q3)(10 marks) Evaluate the following limits:

(1) $\lim_{x \rightarrow \infty} \frac{x^2+1}{2x^2+x-1}$.

(2) $\lim_{x \rightarrow 1^-} \frac{x}{x^2-1}$.

(3) $\lim_{x \rightarrow \infty} \frac{x^2+1}{2x^2+x-1}$.

Q4)(10 marks) Consider the function $y = f(x) = \sqrt{3x^3 - x + 2}$.

(1) Find the equation of the tangent line to the graph of $y = f(x)$ at the point where $x = 1$.

(2) Find the points on the graph of $y = f(x)$ at which the tangent line is horizontal.

Q5)(12 marks) Find $\frac{dy}{dx}$ for the following:

(1) $y = x^{\frac{1}{4}}(x + 1)^8$.

(2) $y = \sqrt[3]{\frac{x}{x^2+1}}$.

(3) $y = u^5 - u^3 + u^2 + 1$, $u = x^2 + 1$.

Q6)(8 marks) Let $y = f(x) = x^4 - x^3 - 3x^2 + 1$.

(1) Find $f''(x)$.

(2) Find the points at which the tangent line to the graph of $f'(x)$ is horizontal.