

SAMPLE PROBLEMS MIDTERM I

MATH 132 WI01

I. Compute the following limits (if the limit is $+\infty$ or $-\infty$ or DNE, state whether it is $+\infty$ or $-\infty$ or DNE; leave the answer in fractions)

$$(a) \quad \lim_{x \rightarrow 2} \frac{4 - x^2}{x^2 - x - 2}$$

$$(b) \quad \lim_{x \rightarrow \infty} \frac{x^2 + 6x + 9}{(7x - 5)^2}$$

$$(c) \quad \lim_{x \rightarrow 3^+} \sqrt{x - 3}$$

$$(d) \quad \lim_{x \rightarrow -\infty} \frac{5x - 7}{x - 7}$$

$$(e) \quad \lim_{t \rightarrow 2} \frac{7t - 4}{t - 2}$$

$$(f) \quad \lim_{h \rightarrow 0} \frac{\frac{5}{4+h} - \frac{5}{4}}{h}$$

$$(h) \quad \lim_{x \rightarrow -5} \frac{x^2 - 25}{x - 5}$$

$$(i) \quad \text{If } f(x) = 11x^2 + 7, \text{ find } \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$(j) \quad \lim_{x \rightarrow -\infty} \frac{4 - x^2}{1 - x}$$

$$(k) \quad \lim_{x \rightarrow \infty} \frac{5 - x^2}{x^4 - 8x^2 + 2}$$

$$(l) \quad \lim_{x \rightarrow 0^-} \frac{x^2 + 4}{x}$$

$$(m) \quad \lim_{x \rightarrow 1^-} \frac{7}{1 - x}$$

$$(n) \quad \lim_{x \rightarrow 1} \frac{7}{1 - x}$$

$$(o) \quad \lim_{x \rightarrow 0} \frac{7}{x}$$

$$(p) \quad \lim_{x \rightarrow 0} \frac{7}{x^2}$$

II. Let

$$f(x) = \begin{cases} 5, & \text{if } x > 4 \\ x, & \text{if } x \leq 4 \end{cases}$$

$$(a) \quad \text{Find } \lim_{x \rightarrow 4^+} f(x)$$

$$(b) \quad \text{Find } \lim_{x \rightarrow 4^-} f(x)$$

$$(c) \quad \text{Find } \lim_{x \rightarrow 4} f(x)$$

$$(d) \quad \text{Find } \lim_{x \rightarrow \infty} f(x)$$

(e) Find $\lim_{x \rightarrow -\infty} f(x)$

III. Find the derivatives of the following functions (do not simplify)

(a) $f(x) = (2 + 15x - 7x^2)(x^9 - 8x + 4)$

(b) $f(t) = \frac{t^3 + 7t + 5}{t^5 - 9t^2 + 3}$

(c) $y = (8x + 5)^{\frac{4}{7}} + e^{\frac{4}{7}}$

(d) $p = \frac{5}{q}$

(e) $y = \frac{(3x + 1)^5 - 5x}{7}$

(f) $s = (5t^3 + 1)^7(3t - 4)^6$

IV. Find the equation of the tangent line to the graph of $y = x^3 - 7x + 6$ at the point $(1, 0)$

V. Find the rate of change of $f(x) = 9x^6 - 8x^3 + 11$ with respect to x and evaluate it when $x = 1$

VI. If a manufacturer's average cost function is given by

$$\bar{C} = .005q^2 - .5q + 70 + \frac{300}{q},$$

find the marginal cost function. What is the marginal cost when 50 units are produced?

VII. Use *Chain Rule* to find $\frac{dy}{dx}$ where $y = 3u^8 - 4$ and $u = 7x^3 + 3x - 1$

VIII. Use *Chain Rule* to find $\frac{dy}{dx}$ where $y = 11u^5 - 7u + 11$ and $u = 9x^6 - 8x^3 + 11$

IX. Solve the inequality

$$(a) \quad \frac{(2-x)(x-5)}{11-x} > 0$$

$$(b) \quad \frac{(7-x)(x-9)}{8-x} \leq 0$$