MIDTERM I, FORM A

MATH 132 WI00

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) $\quad \lim\limits_{t \to 2} \sqrt[3]{t^2 + 1}$ $\qquad$ (6 points)

(b) $\quad \lim\limits_{x \to 2} \dfrac{4 - x^2}{x^2 - 5x + 6}$ $\qquad$ (6 points)

(c) $\quad \lim\limits_{x \to \infty} \dfrac{x^{1997} + 9}{1997x^{1998} + 2000}$ $\qquad$ (6 points)

(d) $\quad \lim\limits_{x \to -\infty} \dfrac{x}{1 - 7x}$ $\qquad$ (6 points)

(e) $\quad$ Let $f(x) = 5x - 8$, find $\lim\limits_{h \to 0} \dfrac{f(x + h) - f(x)}{h}$ $\quad$ (6 points)

(f) $\quad \lim\limits_{h \to 0} \dfrac{\frac{4}{3+h} - \frac{4}{3-h}}{h}$ $\qquad$ (6 points)

(g)   Given the graph of a function $G(x)$ (below)
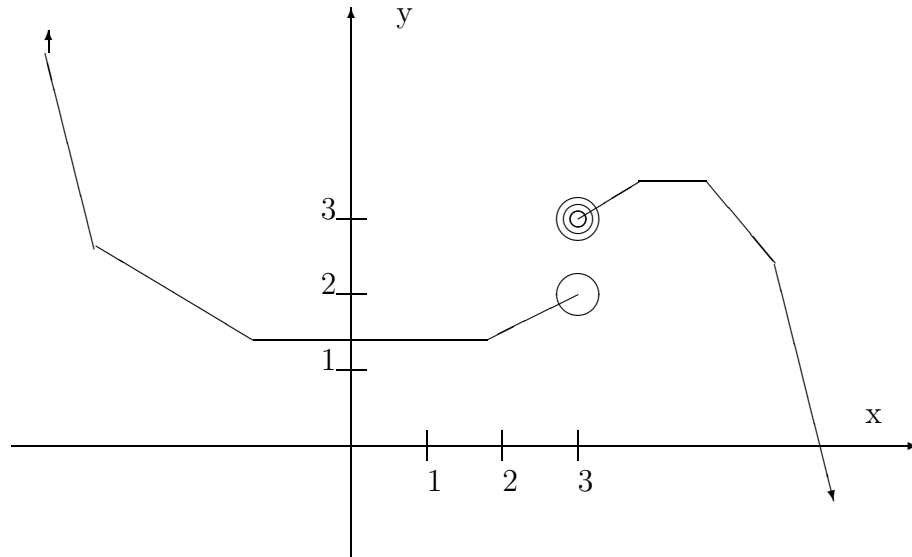
find:

(i) $\lim\limits_{x \to 3^+} G(x)$ (2 points)

(ii) $\lim\limits_{x \to 3^-} G(x)$ (2 points)

(iii) $G(3)$ (2 points)

(iv) $\lim\limits_{x \to \infty} G(x)$ (2 points)

(v) $\lim\limits_{x \to -\infty} G(x)$ (2 points)

(h)   Let $f(x) = \begin{cases} \frac{7}{x+1}, & \text{if } x < 1 \\ \frac{7}{4}, & \text{if } x = 1 \\ \frac{14}{x+5}, & \text{if } x > 1 \end{cases}$ Find:

(i) $\lim\limits_{x \to 1^+} f(x)$ (2 points)

(ii) $\lim\limits_{x \to 1^-} f(x)$ (2 points)

(iii) $f(1)$ (2 points)

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

(a) $f(s) = (2s + 1)(1 - s + 3s^2)$ (6 points)

(b) $f(t) = \dfrac{t^3 + 2}{2t^5 + t + 4}$ (6 points)

(c) $y = [(3x - 7)^5][(x^2 + 5)]$ (6 points)

III. Solve the inequality
$$\frac{(7 - x)(5 + x)}{(x - 3)} \leq 0 \qquad \text{(10 points)}$$

IV. Find the equation of the tangent line to the graph of
$$y = 8x^3 + 7x - 6$$
at the point $(1, 9)$ (8 points)

V. Let $p = 200 - 2q - q^2$ be the demand function for a manufacturers product.

(a) Find the rate of change of price p per unit with respect to quantity q (6 points)

(b) How fast is the price changing with respect q when $q = 5$ (6 points)