MAT 131 – CALCULUS II – FALL, 1999
MIDTERM EXAMINATION II

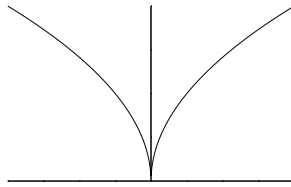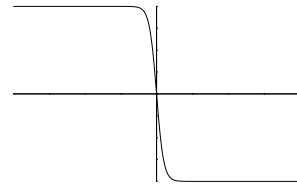November 10, 1999

Name:	ID Number:	Section:

Problem 1. (15 points) Here are the graphs of five functions.
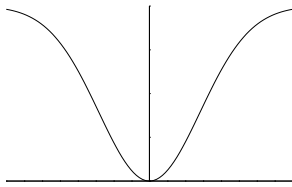
(a) _____ (b) _____ (c) _____
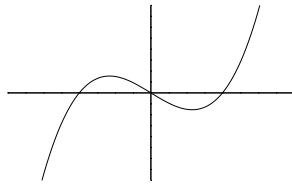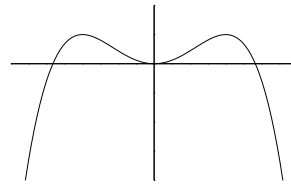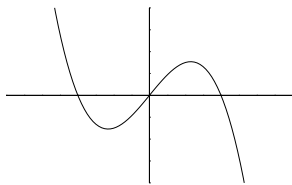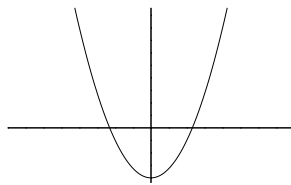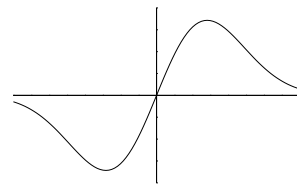
(d) _____ (e) _____

For each of the graphs above, indicate which of the following graphs is its derivative.

(1) (2) (3)
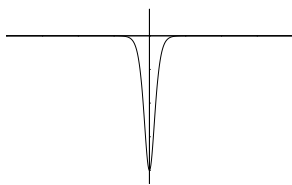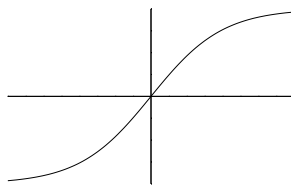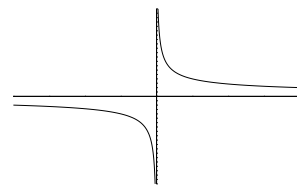
(4) (5) (6)

Problem 2. (30 points) Calculate the derivatives of the following functions.

(a) $f(x) = 7^x$:

(b) $g(x) = \sin(3x)$:

(c) $h(x) = x^{17} - 3x^4 + 6x + 5$:

(d) $k(x) = \tan(2x)$:

(e) $f(x) = \cos(x)\sin(x)$:

(f) $g(x) = \dfrac{3x^2}{x^3 - 17}$:

(g) $h(x) = x^2 e^{x-1}$:

(h) $k(x) = \sec(2^x)$:

(i) $f(x) = \dfrac{\sin(6x)}{\sin(7x)}$:

(j) $k(x) = (x^3 + x - 1)^{101}$:

(k) $F(t) = Ae^{kt} + Be^{-kt}$:

(l) $G(y) = \sqrt{1 + \sin(y/2)}$:

(m) $H(x) = 3x^e$:

(n) $K(z) = e^{\cos z}$:

(o) $R(c) = Kc(r - c)$:

Problem 3. (5 points) Which one of the following limits gives $f'(2)$, where $f(x) = \sin(\pi e^x)$?

(a) $\displaystyle\lim_{x \to 2} \frac{\sin(\pi e^x) - \sin(2\pi)}{h}$

(b) $\displaystyle\lim_{h \to 0} \frac{\sin(\pi e^2 e^h) - \sin(\pi e^2)}{h}$

(c) $\displaystyle\lim_{h \to 0} \frac{\sin(\pi e^x) - \sin(\pi e^a)}{h}$

(d) $\displaystyle\lim_{h \to 0} \frac{\sin(\pi (e^x + e^h)) - \sin(\pi e^x)}{h}$

Problem 4. (10 points) Find the equation of the line tangent to the graph of the function $f(x) = 1/(1 + x^2)$ at $x = 2$.

Problem 5. (10 points) Let $g(z) = -2z^3 - 3z^2 + 2$.

(a) On what interval(s) is g increasing?

(b) On what interval(s) is g concave up?

Problem 6.   (10 points) Suppose that the deer population $P(t)$ (*i.e.*, number of deer) in a certain game preserve varies periodically throughout the year according to the formula

$$P(t) = 25\sin(\pi(t-5)/6) + 75,$$

where t denotes the number of months since January 1.

(a) What is the deer population on September 1?

(b) On June 1, is the population growing or shrinking?

(c) On June 1, how fast is the population changing? (Be sure to specify the units for your answer. A decimal approximation to your answer is not necessary.)

Problem	1	2	3	4	5	6	**Total**
Score							