MATH 209/4 all sections except EC: - Fundamental Mathematics II

Midterm - March 10, 2019, 2pm (1h30min)
Only approved calculators are permitted.

MARKS

[5] **1.** Let $k(x) = 5 - 3x^4$. Work out the following in detail:

$$\lim_{h \to 0} \frac{[k(x+h) - k(x)]}{h}$$

[10] **2.** (a) If $f(x) = -3x^{27} - 8$, find $f'(x)$. Do not simplify.

(b) If $f(x) = [ln(x^2) + 7][2x^3 - 8]$, find $f'(x)$. Do not simplify.

(c) Find $g'(x)$ if $g(x) = \frac{[e^{7x} - ln(x)]}{x^2 - 2e^x}$. Do not simplify.

(d) Find the value of dy if $y = x^7 + 4, x = 3$ and the change in x is -0.2.

[7] **3.** A sum of fifteen thousand dollars is invested for eight years. Assume that interest is compounded continuously and determine the annual rate of return in the following three cases:

(a) the value after 8 years is twenty thousand dollars.

(b) the value after 8 years is ten thousand dollars.

(c) the value after 8 years is fifteen thousand dollars.

[8] **4.** The cost of marketing x trees is given by the function $C(x) = 15,000 + 10x$.

(a) Find the average cost per unit if 150 trees are produced.

(b) Find the marginal average cost when 150 trees are produced and interpret the results.

(c) Use (a) and (b) to estimate the average cost per tree if 151 trees are produced.

[7] **5.** Sales of x units of a product are found to be given by the function $S(x) = 2x^3 + 3x^2 - 6$. At what rate are sales changing when $x = 4$?

[8] **6.** A point is moving along the y axis at a constant rate of 5 units per second. Find the rate of change of its distance from $(2, 0)$ when $y = -3$.

[15] **7.** (a) Give an example of a function f whose derivative equals 1 when evaluated at $x = 0$ and equals 7 when evaluated at $x = 3$.

(b) Give an example of a function which is continuous at all points except -1, 2, and 10. You can do this by using a graph if you wish.

(c) Give an example of a function which is differentiable at all points except 1, 3, and -4. You can do this by using a graph if you wish.