

King Saud University:
Second MidTerm Exam.
Time: 90 min.

Math. Dept.
Semester I

Math-109
1427-1428 H

Max. Marks 20

Question 1:

(2 + 3 + 3 + 3)

(a) Find the equation of the normal line to the graph of the function

$$f(x) = (x^2 + 6x)^2(1 - 3x)^4 \text{ at } x = 1.$$

(b) If $f(x) = x \cos 2x$, then show that $f'''\left(-\frac{\pi}{4}\right) = 2\pi$.

(c) Find y' , if $\sec(x + y) + \csc(x + y) = 5$.

(d) Find the absolute extrema of $f(x) = \sqrt{8 - 2x - x^2}$ on $[-3, 2]$.

Question 2:

(4 + 2 + 3)

(a) Let $f(x) = 4x^5 - 25x^4 + 40x^3$ be a function.

(i) Find critical number of the function.

(ii) Find intervals over which the given function is increasing and decreasing.

(iii) Locate local extrema of the given function.

(iv) Sketch the graph of the given function.

(b) Find two nonnegative numbers whose sum is 36 and whose product is maximum.

(c) Evaluate the integral $\int_0^1 (x + 1)^2 \ln(x + 1) dx$.