FINAL EXAM FOR MTH102 SPRING007

THE 102 TEAM : AYMAN, MARWAN, LEDUC, LUIS, TOM, YUSUF, ZAYID

Name———————————, Id. Num.—————————————-, Score $\overline{100}$

QUESTION 1. *(20 points, each = 5 points)*
SHOW WORK TO RECEIVE FULL CREDIT BUT DO NOT SIMPLIFY YOUR ANSWER

(1) *Find each of the following:*

(a) $f(x) = \left(\ln(x^3 - 2x + 1)\right)^8$

$f'(x) =$

(b) $f(x) = \dfrac{e^{x^2}}{x + e^x}$

$f'(x) =$

(c) $f(x, y) = xe^y + ye^x$

$f_x(x, y) =$

$f_{xy}(x, y) =$

(d) $f(x) = 10^{2x} \ln(x + x^{-2})$

$f'(x) =$

QUESTION 2. *(18 points, each = **6 points***)*

(1) $\displaystyle\int_1^2 \frac{x^3\,e^{-x} - 3 + x^2}{x^3}\,dx =$

(2) $\displaystyle\int x(x^2 - 9)^4\,dx =$

(3) $\displaystyle\int \frac{x^2 - 10x + 7}{(x^3 - 15x^2 + 21x + 8)}\,dx =$

QUESTION 3. *(***10 points***) (4) The marginal average cost for producing x fuel-cell cars is given by*
$-\frac{2,000,000}{x^2}$ *and the average cost of producing 1000 vehicles is* $\$27,000$ *per vehicle. Find the marginal cost* $C'(x)$ *and evaluate it for a production of 2000 vehicles.*
*(***Hint: As a first step, Find the AVERAGE COST***)*

QUESTION 4. *(***10 points***) Find Local Min. and Local max., if any, for* $f(x) = -x^3 + 6x^2 - 9x.$

QUESTION 5. *(**12 points**) Let x be the number of units from product A, and y be the number of units from product B. Given the total profit function $P(x, y) = xy + x^2 + y^2 - 90x - 60y + 100$. For what values of x and y will the profit be maximum? What is the maximum profit?*

QUESTION 6. *(**10 points**) Sketch the graph of $f(x)$ that satisfy the following conditions:*

1) $f(-2) = 1, f(0) = 0, f(2) = 1$.

2) $f'(0) = 0, f'(x) < 0$ on the interval $(-\infty, 0), f'(x) > 0$ on the interval $(0, \infty)$

3) $f''(-2) = 0, f''(2) = 0$.

4) $f''(x) > 0$ on the interval $(-2, 2)$ and $f''(x) < 0$ on the interval $(-\infty, -2) \cup (2, \infty)$

5) $\lim_{x \to -\infty} f(x) = \lim_{x \to \infty} f(x) = 2$

QUESTION 7. *(**5 points**) a) Find all the horizontal and vertical asymptotes of* $\frac{x^2+x-6}{2x^2-18}$.

*(**8 points**) b) Find the equation of the tangent line to the curve* $x^2 - y = 4e^y$ *at the point* $(2,0)$

*(**7 points**) c)Let* x *be the number of units from product* A, *and* p *be the selling price per unit. If* $x = f(p) = \frac{50}{p} - p + 15$.
a) Find the elasticity at $p = 5$.

b) If the 5 dollars price changes by 20%, *use part (a) to approximate the change in demand.*