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MTH 102, Calculus for Business, Exam I, Spring 2013

Ayman Badawi

QUESTION 1. Find $f'(x)$ and do not simplify:

(i) $f(x) = e^{(3x+2)} ln(7x + 10)$

(ii) $f(x) = \sqrt[4]{2x + x^2 + 1} + 4x + 8x^3$

(iii) $f(x) = ln[(2x + 5)^7 (e^x + 3x - 1)^3] + 5x - 10$

(iv) $f(x) = ln[\frac{(x^2+x)^3}{\sqrt{5x+2}}] + \frac{7}{2x} + 10$

QUESTION 2. (i) $lim_{x\to 1} \quad \frac{\sqrt{2x+7}-3}{x^2-1}$

(ii) $lim_{x\to \ -3^+} \quad \frac{5-x}{x-3}$

(iii) $lim_{x\to \ -\infty} \quad \frac{-3x^3+2x+4}{2x+7}$

(iv) $lim_{x\to\infty} \quad \frac{-5x^2+7x-3}{2x^2+6x+9}$

QUESTION 3. Given $P(x) = 30ln(x) - 4x$ is the profit function where x is number of items in hundreds (and hence $P(x)$ is in hundreds), $1 \leq x \leq 10$.

(i) Find the profit when $x = 5$

(ii) Find the equation of the tangent line to the curve of $P(x)$ when x = 5.

(iii) Use part (ii) to approximate the profit when $x = 5.2$

(iv) Find the actual profit when $x = 5.2$

(v) Find the marginal profit when $x = 5$.

(vi) Use part (i) and part (v) to approximate the profit when $x = 6$.

(vii) For what values of x does the profit increase?

(viii) What is the maximum profit?

QUESTION 4. Let $C(x) = \sqrt{x^2 - 21x + 225}$ be the cost function where x is number of items in hundreds $1 \leq x \leq 12$.

(i) For what values of x does the cost increase?

(ii) For what values of x does the cost decrease?

(iii) What is the minimum cost?

(iv) If we replaced the number 12 above by another bigger number, will the minimum cost change? explain.

QUESTION 5. Find the y-intercept and the horizontal asymptote for $y = -4xe^{(-03x+7)} + 2$ then roughly give a sketch of the graph.

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MTH 102, Calculus for Business, Exam II, Spring 2013

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QUESTION 1. Sketch the graph of $f(x) = \frac{4x}{2x^2-10x+8}$. Find y-intercept, V.A, H. A, min. values , max. values, values of x where $f(x)$ is increasing or decreasing.

QUESTION 2. Given $P(x,y) = 4y\sqrt{3x+1} - 2\frac{\sqrt{y}}{2x+2} + 4xy$ is the total profit in 100's of DHS on two different products (x is number of items from the first product in hundreds, y is the number of items from the second product in hundreds).

a) Find $P(5,9)$, $P_x(5,9)$, and $P_y(5,9)$.

b) Use (a) to approximate $P(4.8, 9.2)$.

QUESTION 3. Find the following partial derivatives and do not simplify $f(x,y) = 4e^{(2y+4x^2)} + 2x^2y + y^5 + 3x^2 + 3ln(9x+7y)$

a) $f_x(x,y) =$

b) $f_y(x,y) =$

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

d)$f_{yx}(x,y)$ =

QUESTION 4. Given

$$\sqrt{2x+1} + 4ln(y+2x-8) + 7ye^{(x-4)} - 10 = 0$$

a) Show that the point (4, 1) lies on the curve of the above equation.

b) Find the equation of the tangent line to the curve at the point (4, 1).

c) Use (b) to approximate the value of y when $x = 4.2$.

QUESTION 5. Let x be number of items in tens of a product A, y be number of item in tens of product B. Given the total cost function in tens of Dhs for both products $C(x, y) = 4e^{x-6} - 4x + 2y^2 - 16y + 200$

a) How many items should we buy from each product in order to achieve minimum cost?

b) What is the minimum cost?

QUESTION 6. Given the marginal cost function $MC(x) = 4\sqrt{x+3} + 6\frac{3}{3x-17}$ and the cost of 6 items is 210 Dhs. Find the cost of 33 items.

QUESTION 7. Evaluate the following integrals:

1) $\int (8e^{(4x+2)} + 16x)[e^{(4x+2)} + 4x^2 + 8]^3$ dx

2) $\int \ \frac{4x+2}{x^2+x+3}\ dx$

3) $\int \ \frac{2x^4+7x^6-12}{x^7}\ dx$

4) $\int \ \frac{8}{e^{(4x+3)}}\ dx$

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MTH 102, Calculus for Business, Final Exam, Spring 2013

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QUESTION 1. (8 points) Evaluate the following limits:

(i) $lim_{x \to 2} \frac{\sqrt{x+2} - \sqrt{2x}}{x^2 - 2x}$

(ii) $lim_{x \to 4^-} \frac{x^2+2x-3}{(x+3)(x-4)}$

QUESTION 2. (12 points)
Find $f'(x)$ and do not simplify

(i) $f(x) = 1 - \frac{3}{x} + x^{-4} + e^{-x^2}$

(ii) $f(x) = \frac{x^2-1}{2x+x^3}$

(iii) $f(x) = \sqrt{x}ln(x^3 + 2x)$

QUESTION 3. (15 points) Evaluate the following integrals:

(i) $\int (\sqrt{x} - x^{-3} + e^{-x} + 2x^{e})\, dx$

(ii) $\int x^2 ln(x)$

(iii) $\int_{-2}^{-1} \frac{4}{2x+6}$

QUESTION 4. (3 points) Find the value of K so that $\int \sqrt{2x+1} = K(2x+1)^{3/2}+C$

QUESTION 5. (7 points) a) Find the equation of the tangent line to the curve of $x^2 + y^2 + ln(xy) - 2xy = 0$ at the point $(1, 1)$.

b) Approximate the y-value when $x = 1.2$.

QUESTION 6. (11 points)

(i) Find the absolute minimum and absolute maximum values of the function $f(x) = x^3 - 6x^2 + 9x - 5$ on the interval [0, 4].

(ii) Find the intervals on which the function above concaves upward and those on which it concaves downward. Also, find any inflection points.

QUESTION 7. (12 points) A semiconductor manufacturer produces Ethernet cards for the PC industry. The company estimates its weekly production cost is given by $C(x) = 2000 + 10xln(\sqrt{x})$, where $C(X)$ is the total cost in dollars for production x units.

a) Find the average cost if 100 units are produced each week.

b) How many units per week will minimize the average cost?

QUESTION 8. (9 points) Let $f(x, y) = 5x^2y - ln(x - 2y)$

a) Find $f_x(x, y)$

b) Find $f_y(x, y)$

c) Find $f_{yx}(x, y)$

QUESTION 9. (9 points) For a certain product, the price-demand function is $x = \sqrt{320 - 10p}$ and the price-supply function is $x = \sqrt{5p - 10}$. Note that p denotes the price per item in dollars, and x denotes the quantity. Find the equilibrium point. At the price of the equilibrium point, is the demand elastic or inelastic? explain.

QUESTION 10. (14 points) A delight is a small catering business that supplies packaged foods to area grocery stores. Their regular supply consists of two items curried noodles and stir-fry medley. The daily demand function for the curried-noodles is $x = 84 - 14p + 6q$ and the daily demand function for the stir-fry-medley is $y = 58 + 8p - 16q$.

Where p is the price per unit (in dollars) for selling x unites of the curried-noodles and q is the price per unit (in dollars) for selling y units of the stir-fry-medley. What should be the price per unit for each type of the given foods in order to maximize revenue (daily revenue) ? Verify your answer using the second derivative test in two variables.

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