جامعة بيرزيت

BIRZEIT UNIVERSITY

Mathematics Department SCORE:...18.../25

Math 235-First Hour Exam

Spring 2013/2014

Please circle your discussion section number or hour:

	Instructor	Times		Room No.
1	Hiba Sharha	Saturday	14:00 - 14:50	SCI216
2	Mahmoud Ghannam	Monday	11:00 - 11:50	BUS229
3	Ifaifel Abukaresh	Wednesday	11:00 - 11:50	BUS129
4	Iflaifel Abukaresh	Wednesday	12:00 - 12:50	SCI115
5	Hiba Sharha	Wednesday	14:00 – 14:50	SCI216
6	Hiba Sharha	Saturday	10:00 – 10:50	SCI013
7	Mohammad Madiah	Monday	13:00 – 13:50	SCI214
8	Saddam Zaid	Monday	14:00 – 14:50	SCI216
9	Hiba Sharha	Wednesday	10:00 – 10:50	SCI021
10	Hiba Sharha	Wednesday	12:00 – 12:50	SCI213

Note: DO NOT forget to fill the answers of the multiple-choice questions in the table below:

6

12

Page 1	
1	D
2	D
3	C
4	C
5	C

Page 2	
6	b
7	D
8	b
9	b
10	A

Page 3	
11	C
12	D
13	A
14	D
15	D

Page 4	
16	D
17	C
18	A
19	A
20	A

There are 2 questions in 5 pages. Time: 75 minutes.

Question 1. (20 points) Circle the most correct answer:

1. If the cost function for a commodity is $C(x) = 3x + 2^{-x} + 17$, then the fixed cost equals:

f

   (a) \$19

   (b) \$22

   (c) \$18

   (d) \$17

2. $\lim_{x \to 1} \frac{x^2+1}{x-1} =$

$\frac{1+1}{1-1} = \frac{2}{0} =$

   (a) 2

   (b) 0

   (c) -1

   (d) undefined

3. A principal of \$1000 is invested for 6 months at a simple interest rate of 3%, then the future value of the investment is:

$S = P + I$

$I = Prt$

$(1000)(0.03)(.5)$

   (a) \$180

   (b) \$1180

   (c) \$15

   (d) \$1015

4. Assume that the revenue function for a product is quadratic, then $R(0) =$

   (a) 0

   (b) $-$fixed cost

   (c) fixed cost

   (d) unknown

$8p + \cancel{4q} = 160$

$5p - \cancel{4}q = 24$

$\frac{13p}{13} = \frac{184}{13}$

~~Supple~~

demand $(2p + q = 40)4$

Supply $5p - 4q = 24$

~~5.~~ Assume that the demand function in a market is $2p + q = 40$ and the supply function is $5p - 4q = 24$, if the price is \$8, then there will be:

$2p + q = 40$

$\cancel{16} + q = 40$
$-16 \quad -16$

$q = \cancel{23}$ 14.153

   (a) Shortage

   (b) Surplus

   (c) Market equilibrium

6. $\lim_{x \to -\infty} \frac{9x - 3x^2 + 4x}{1 - 2x^2} =$ $\frac{-3}{-2} = \frac{3}{2}$

   (a) 0

   (b) $\frac{3}{2}$

   (c) $\frac{-3}{2}$

   (d) undefined

7. If \$2100 is invested for 4 years so that the future value of the investment is \$3000 compounded annually, then the interest rate is:

   $S = p(1+\frac{r}{m})^{t \cdot m}$

   $\frac{3000}{2100} = \frac{\cancel{2100}(1+\frac{r}{m})^4}{\cancel{2100}}$

   $\sqrt[4]{1.42857} = \sqrt[4]{(1+r)^4}$

   $= 1+r$

   (a) 7%

   (b) 4.2%

   (c) 9.3%

   (d) 0.093%

8. If $f(x)$ is continuous, then $f(x)$ is differentiable:

   (a) True

   (b) False

9. Which one of the following functions is continuous over the interval $(-\infty, \infty)$:

   (a) $x^2 + x^{-1} + 3$

   (b) $\frac{1}{x^2+1}$

   (c) $\frac{6}{x^2-9}$

   (d) None of the above

10. If $R(x)$ is the total revenue function for a product, then the estimate increase in revenue from selling the 16^{th} unit equals:

   (a) $R'(15)$

   (b) $R'(16)$

   (c) $R'(17)$

   (d) $R(16) - R(15)$

$-p - 6q = -420$) $-$

$p - 2q = 100$

$\frac{-8q}{-8} = \frac{520}{-8}$

$420 - 6q = p + 6q$

$2q + 100 = p$

$-2q$

11. If the demand function for a product is $p = 420 - 6q$ and the supply function is $p = 2q + 100$, then the market equilibrium point is:

$240 - 6q = 2q + 100$

$-100 + 6q \quad + 6q - 100$

$\frac{340}{8} = \frac{8q}{8}$ $\quad 420 - 6($

42.5

   (a) $(80, 260)$
   (b) $(80, 60)$
   (c) $(40, 180)$
   (d) $(40, 240)$

12. If $f(x) = x^5$, then the average rate of change of f over the interval $[-1, 1]$ equals:

$\frac{f(b) - f(a)}{b - a} = \frac{1 - -1}{1 - -1} = \frac{2}{2} =$

   (a) 0
   (b) $\frac{1}{2}$
   (c) $\frac{-1}{2}$
   (d) 1

13. If the demand function for a certain commodity is linear, then the slope of the demand function is always negative:

   (a) True
   (b) False

14. If the revenue function $R(x) = 3x^3 + 6x^2 + 5$, then the instantaneous rate of change of the marginal revenue is:

$= 9x^2 + 12x + 0$

$= 18x + 12$

   (a) $\frac{3x^3+6x^2+4}{x}$
   (b) $6x^2 + 8x$
   (c) $9x^2 + 12x$
   (d) $18x + 12$

15. How long does it take an investment to double if it is invested at annual rate of 4% compounded continuously:

$2P = Pe^{rt}$ $\quad 2P = P(1 + \frac{r}{m})^{m \cdot t}$

$\frac{2P}{P} = \frac{Pe^{(0.04)t}}{P}$ $\quad \frac{2P}{P} = \frac{P(1 + 0.04)^t}{P}$

$\frac{\ln 2}{\ln 0.04} = \frac{\ln(0.04)^t}{\ln 0.04}$ $\quad \frac{2}{1.04} = \frac{(1.04)^t}{1.04}$

   (a) 3 years
   (b) 4 years
   (c) 50 years
   (d) 17 years

16. If $y = x^4 - 4x - 1$, then the function has a horizontal tangent at $x =$

(a) 1

(b) -1

(c) 2

(d) Does not have a horizontal tangent

$0 = x^4 - 4x - 1$

17. If $y = \sqrt[3]{x^2 - 3x + 8}$, then $y'(0) =$

(a) $\frac{1}{12}$

(b) $\frac{-1}{2}$

(c) $\frac{-1}{4}$

(d) None of the above

$(x^2 - 3x + 8)^{\frac{1}{3} - \frac{3}{3}} \rightsquigarrow \frac{1}{3}(x^2 - 3x + 8)^{-\frac{2}{3}} \cdot (2x - 3)$

$\frac{(2x+3)}{3(x^2-3x+8)^{\frac{2}{3}}} = \frac{-\cancel{3}}{\cancel{3}(0-0+8)^{\frac{2}{3}}}$

$\frac{-1}{\sqrt[3]{8^2}}$

18. Let $f(x) = \dfrac{x}{x+1}$, then $f''(x) =$

(a) $\frac{1}{(x+1)^2}$

(b) $\frac{-1}{(x+1)^2}$

(c) $\frac{2}{(x+1)^3}$

(d) $\frac{-2}{(x+1)^3}$

$\frac{(x+1)\cdot 1 - x \cdot (1)}{(x+1)^2} = \frac{x+1-x}{(x+1)^2}$

$\frac{(x+1)^2 \cdot 0 - 2\cancel{(x+1)}(1) \cdot 0}{((x+1)^2)^2}$ 0

$(x+1)^2$

$\frac{1}{(x+1)^2}$

$\frac{\cancel{(x+1)^2} \cdot 0 - 1(2(x+1)) \cdot (1)}{((x+1)^2)^2} = \frac{-\cancel{2}x - 1}{\cancel{2}(x+1)^3}$

19. $\lim\limits_{x \to 3} \dfrac{2x^2 - 7x + 3}{9 - x^2} =$

(a) $\frac{-5}{6}$

(b) $\frac{5}{6}$

(c) -2

(d) 2

20. If the total cost of producing 150 printers is \$3000, then the average cost per printer equals:

(a) \$0.05

(b) \$20

(c) \$450000

(d) \$3000

$.27$

$.277$

$\frac{2(9) - 7(3) + 3}{9 - 9} = \frac{0}{0}$

-1

$\frac{(\cancel{x-3})(x+\frac{1}{2})}{(3-x)(3+x)}$

$\frac{-1(x+\frac{1}{2})}{(3-x)}$

$= \frac{-1(3+\frac{1}{2})}{} =$

Question 2. (5 points) Suppose that a manufacturer of electronic devices has fixed cost of \$1700 and the variable cost per unit is $\frac{1}{2}x + 80$, the selling price of one unit is $360 - \frac{1}{2}x$. Answer the following questions:

(1) Find the cost, revenue, and profit functions.

$C(X) = VC + FC \rightsquigarrow \boxed{\frac{1}{2}X^2 + 80X + 1700}$

$R(X) = PX = \boxed{260X - \frac{1}{2}X^2}$

$P(X) = R(X) - C(X)$.

$= 360X - \frac{1}{2}X^2 - (\frac{1}{2}X^2 + 80X + 1700) \rightsquigarrow 260X - \frac{1}{2}X^2 - \frac{1}{2}X^2 - 80X - 1700$

$\boxed{P(X) = \cancel{180X} - X^2 - 1700}$

$180X$

(2) Find the break-even points.

$P(X) = \text{zero} \;/\; C(X) = R(X)$

$0 = 180X - X^2 - 1700$

$(X - 10)(X - 170)$

units $\boxed{X = 10}$ OR $\boxed{170 = X}$ units

break-even point $= (10, 2550)$, $(170, 29750)$ ~~(170, 44200)~~

$R(10) = 260(10) - \frac{1}{2}(100)$

$= 2600 - 50 = \boxed{2550 \$}$

$R(170) = 260(170) - \frac{1}{2}(170)^2$

$= \cancel{44200 \$}$

$\boxed{29750 \$}$

(3) Find the marginal profit at the production level of 20 units and interpret your answer.

$MP = P'(X) = 180X - X^2 - 1700$

$= 180 - 2X \rightsquigarrow \cancel{P(20) = 1800}$

$= 180 - 2(20) = 180 - 40 = 140 \$$

Selling and producing # 21 units icrease the profit approximatly 140 \$

(4) Find the price that gives maximum revenue.

Vertex $= 260X - \frac{1}{2}X^2$

$\frac{-b}{2a} \rightarrow \frac{-260}{2 \cdot -\frac{1}{2}} = 260$ units

$P = \cancel{260(260)}\ 260 - \frac{1}{2}(260)$

$= 260 - 130 = \boxed{130 \$}$

price.

(5) Find the maximum revenue.

$R(\frac{-b}{2a}) \rightsquigarrow$

$= 260(260) - \frac{1}{2}(260)^2$

$= 67600 - 33800 = \boxed{33800 \$ \text{ maximum}}$