Concordia University
Math 209 Midterm Review Sec 3.1-4.6

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Date: 2014/05/16

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marks

[00] **1.** Find the value of the following limit algebraically: $\lim\limits_{x\to -2} \dfrac{x^2-5x-14}{x+2}$

[00] **2.** Consider $f(x) = 5x^2 + 1$:

a) Evaluate $f'(x)$ using the definition: $f'(x) = \lim\limits_{h\to 0} \dfrac{f(x+h)-f(x)}{h}$

b) Using the answer to a), evaluate the value of $f'(2)$

c) Determine the equation of the tangent to $f(x)$ at the point where $x = 2$

[00] **3.** Find $f'(x)$ for the following (Do not simplify answers):

a) $f(x) = 4x^3 + 7x - 8 + \sqrt[4]{x}$

b) $f(x) = \dfrac{4x-5}{x^2+3x}$

[00] **4.** Find the derivatives of the following functions (Do not simplify answers):

a) $f(x) = (e^x + x)^3(2 + \ln x)^4$

b) $f(x) = [e^{12x^3-9x-15} + 4\ln(x^3 + 3x - 1)]^{10}$

[00] **5.** Revenue $R(x)$, Cost $C(x)$ are given by $R(x) = 200x - \dfrac{x^2}{30}$ and $C(x) = 72000 + 60x$
Use differentials to approximate the change in profit as production increases from 1500 to 1510 articles.

[00] **6.** Revenue $R(x)$ where x is the number of articles sold is given by $R(x) = \dfrac{x^3}{3} + 200x$

a) Find the average rate of change in the Revenue as x goes from 20 to 21. Describe in words what this answer represents

b) Find $R'(x)$ at a sales level of 20 articles. Describe in words what this answer represents.

c) Use $R'(20)$ and $R(20)$ to approximate $R(21)$.

d) Find the marginal average Revenue at a sales level of 20 articles. Describe in words what this answer represents.

[00] **7.** At what nominal (yearly) rate compounded continuously must money be invested to double in ten years ?

[00] **8.** The resale value R (in dollars) of a company car after t years is estimated to be given by $R(t) = 20000(0.86)^t$

a) What is the rate of depreciation after one year ?

b) What is the rate of depreciation after two years ?

c) What is the rate of depreciation after three years ?

..... continued

[00] **9.** Consider price p and demand x are related by the equation $x = 300 - (p-15)^2$:

a) Find the rate of change of demand compared to price for each price given and then explain in words what each answer means: (i) $p = 1\$$ (ii) $p = 16\$$.

b) Find the rate of change of price compared to demand for each price given and then explain in words what each answer means: (i) $p = 1\$$ (ii) $p = 16\$$. (round the answers to the nearest cent)

[00] **10.** Consider price p and demand x are related by the equation $2x + xp - p^2 = 104$. If the price is increasing at a rate of $2\$$ per month, when the price is at $4\$$, find the rate of change of the demand per month at this price.

Answers:

1. -9, **2. a)** $10x$ **b)** 20 **c)** $y = 20x - 19$, **3. a)** $12x^2 + 7 + \frac{1}{4}x^{-\frac{3}{4}}$. **b)** $\frac{(x^2+3x)(4)-(4x-5)(2x+3)}{(x^2+3x)^2}$, **4. a)** $f(x) = (e^x+x)^3 4(2+\ln x)^3 \frac{1}{x} + (2+\ln x)^4 3(e^x+x)^2(e^x+1)$. **b)** $10[e^{12x^3-9x-15} + 4\ln(x^3+3x-1)]^9[e^{12x^3-9x-15}(36x^2-9) + \frac{4(3x^2+3)}{x^3+3x-1}]$, **5.** $400\$$, **6. a)** $620.33\$$, **the exact Revenue from the 21st article sold. b)** $600\$$, **the marginal revenue when** $x = 20$ **or the approximate Revenue from the 21st article sold. c)** $R(20) + R'(20) = 7266.66\$$ **d)** $13.33\$$ **the increase in Revenue attributed to each article sold by selling the 21st article., 7.** 6.93%, **8.** $2594\$/year, 2231\$/year, 1919\$/year$**., 9 a)(i) Demand increasing** 28 **articles per** $1\$$ **increase in price (at this point price increase <u>is not</u> lowering the demand). (ii) Demand decreasing** 2 **articles per** $1\$$ **increase in price (at this point price increase <u>is</u> lowering the demand). 9 b) (i) Price increases** $0.04\$$ **per** 1 **article increase in demand (at this point demand increase <u>is</u> causing the price to rise) (ii) Price decreases** $0.50\$$ **per** 1 **article increase in demand (at this point demand increase <u>is not</u> causing the price to rise). 10.** $\frac{dx}{dt} = -4$ **(decrease of 4 articles per month)**