CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number		Section(s)
Mathematics	209/2		All
Examination	**Date**	**Time**	**Pages**
Alternate Midterm	October 2014	1 Hour 30 minutes	2
Instructors			**Course Examiner**
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Special Instructions:

- ▷ Answer all questions.
- ▷ **Only approved calculators are allowed.**

MARKS

[9] **1.** Find limits:

(a) $\lim\limits_{x\to 2} \dfrac{x^2-x-6}{x^2+3x-4}$ (b) $\lim\limits_{x\to 4} \dfrac{\frac{1}{x+2}-\frac{1}{x-10}}{x-4}$ (c) $\lim\limits_{x\to -\infty} \dfrac{2x^2-5}{x^2+4x+4}$

[6] **2.** Let $g(x)=\sqrt{x}+2$. Work out the following in detail:

$$g'(x)=\lim_{t\to 0}\frac{g(x+t)-g(x)}{t}$$

[12] **3.** (a) If $f(x)=2x^{23}-3e^x+\sqrt{\frac{x^9}{x^3}}-\pi^4$, find $f'(1)$. You need not simplify.

(b) If $g(x)=(x-1)\ln(x^2+x-2)$, find $g'(2)$. You need not simplify.

(c) Find $h'(x)$ if $h(x)=\frac{x^3-8x^2}{x-6}$. You need not simplify.

(d) Find the value of dy if $y=(4x-e^x)^{-49}$, $x=2.0$, and the change in x is 0.1.

[8] **4.** A company manufactures video games and the cost and revenue equations are

$$C(x)=100,000+20x$$

$$R(x)=400x-\frac{x^2}{30}$$

where the production output in one week is x video games. If production is increased at a rate of 800 video games per week when production output is $9,000$ video games, find the rate of increase or decrease in revenue and profit.

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[9] **5.** The total cost (in dollars) of producing x bicycles is

$$C(x) = 5,000 + 40x + 0.05x^2$$

(a) Find the total cost and the marginal cost at a production level of 100 bicycles. machines.

(b) Find the average cost and the marginal average cost at a production level of 100 bicycles.

(c) Use the marginal average cost to approximate the cost of producing the $101st$ bicycle.

[8] **6.** Find x' for the function $x(t)$ defined implicitly below. Evaluate x' at the indicated point.

$$x^3 - tx^2 - 4 = 0;\ (t, x) = (-3, -2)$$

[8] **7.** Suppose that a point is moving along the graph of $x^2 + y^2 = 25$. When the point is at (-3, 4), its x coordinate is increasing at the rate of 0.4 unit per second. How fast is the y coordinate changing at that moment?