Department of Mathematical Sciences
FINAL EXAM
MATH 105 Calculus I
Date: *January 17, 2015*
3:30 – 5:30 pm

ID No: _____

Name: _____

Instructor	Male Section	Instructor	Female Section
Viktor Bovdi	01	Viktor Bovdi	51
Fathi Allan	02	Philippe Poulin	52
Philippe Poulin	03	Bachrauoi	53
		K. Abdulkhalikov	54
		Viktor	55
		Abdelrahi	56
		Viktor Bovdi	57
		N Markos	58

Instructions:
1. Read the questions carefully and identify clearly what is given and what you need to find.
2. Show all your work to get full credit.
3. Organize well your work and submit a clean copy.

Questions	Points
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total	

Q(1) Evaluate the following limits (2 points each):

(a) $\lim\limits_{x\to\infty} \dfrac{\sqrt{9+x^2}-2\,x-2}{x-2}$

(b) $\lim\limits_{x\to 0} x^4\cos(\frac{2}{x})$

(c) $\lim\limits_{x\to 0}\dfrac{x+2}{x^2+x-2}$

(d) $\lim\limits_{x\to\infty}(1-\frac{3}{x})^x$

(e) $\lim\limits_{x\to 0}\dfrac{\cos 2x-\cos 3x}{x^2}$

Q(2) Use the given graph for the function of $f(x)$ to state the evaluate the followings if it exists. If it doesn't exist, state why.
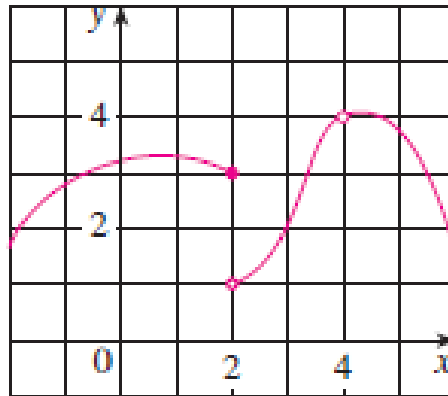
a) $\lim\limits_{x \to 2} f(x)$

b) $\lim\limits_{x \to 4} f(x)$

c) $f(4)$

d) $f(2)$

Q(3) Find the Values of the constants A and B that make the function f(x) continuous for all x

$$f(x) = \begin{cases} \dfrac{x^2 - 4}{x - 2}, & \text{for} \quad x < 2 \\ ax^2 - bx + 3, & for \quad 2 \le x < 3 \\ 2x - a + b, & \text{for} \quad x \ge 3 \end{cases}$$

Q(4) A cylindrical can with radius 5 cm is being filled with water at a rate of $3 \ m^3/min$. How fast is the height of the water increasing?

Q(4) Find $\frac{dy}{dx}$ (Do not simplify)

a) $y = \dfrac{1}{\sqrt{1+\sqrt{1+x}}}$

b) $y = (\sin(x^2 + 3 - 1))^2$

c) $y = \tan^{-1}(e^{3x} + 3) + \cos(\pi)$

d) $ye^x + xe^y = 5$

e) $y = \log_{10}(x + 2)$

Q(5) If $y = e^{2x}$. Show that $y'' - 3y' + y = 0$.

Q(6) Evaluate the following integrals:

a) $\int (x + 1)(x + 2)\, dx$;

b) $\int \frac{1}{1-2x}\, dx$;

c) $\int \frac{x}{1+x^4}\, dx$.

Q(7) Sketch the region bounded by $y = x^2$ and $x = y^2$, and compute its area.

Q(8) The sum of two numbers is 10. Find the two numbers such that the sum of their squares is minimum.

Q(9) Let $f(x) = x^3 + 3x^2 - 24x + 20$

    a）Find the intervals where the function is increasing and decreasing.

    b）Find all local extrema.

    c）Determine the intervals where graph of the function is concave up and concave down, and identify inflection points