SULTAN QABOOS UNIVERSITY
DEPARTMENT OF MATHEMATICS AND STATISTICS
9 March 2008

MATH 2107 CALCULUS I
TEST I VERSION I
(Time allowed: 60 minutes)

NAME:_____ **ID#:**_____ **Section:**_____

Instructions:

- This test contains 6 pages (3 sheets back to back) and 12 questions. **The empty extra sheet is for rough work and will not be marked**.
- Write your name, ID number and Section number in the first page and ID number at the top of each sheet.
- Attempt all questions, writing your answer in the space below the statement of the question. For questions 1-6 show all your work.
- For **Multiple Choice** questions, **CIRCLE the correct answer**.
- Please do NOT SEPARATE the pages of this booklet.

DO NOT WRITE ON THIS BOX!

Problem	points	score
1	5 pts	
2	4 pts	
3	5 pts	
4	7 pts	
5	4 pts	
6	3 pts	
7-12	12 pts	
TOTAL	40 pts	

1. (a) (2 points) Find $\lim_{x\to 0^+} \dfrac{x^2-3x+2}{x}$.

(b) (3 points) Let $f(x) = \begin{cases} \dfrac{x^2+5x-14}{x^2-4}, & x \neq 2 \\ 3, & x = 2. \end{cases}$

Determine if f is continuous at $x = 2$.

2. (4 points) Find $\lim_{x\to 0} \dfrac{1-\cos 3x}{x^2}$.

3. A car is travelling on a straight road so that in t mins it reaches a distance of $s = 7t^3$ mtrs.

(a) (2 points) What is the average velocity of the car over the first 10 mins of its travel ?

(b) (3 points) What is the instantaneous velocity at the end of 5 mins ?

4. (a) (3 points) Find $\dfrac{dy}{dx}$ if $y = x^3 \tan x - \sec 5x + 2$.

(b) (4 points) Find an equation of the tangent line to the graph of $y = \dfrac{x^3 + 7}{x}$ at $x = 1$.

5. (4 points) Use an appropriate local linear approximation to estimate the value of $(16.1)^{1/4}$.

6. (3 points) Suppose that f is a differentiable function with the property that $f(x+h) = f(x) + f(h) - 7xh$ and $\lim_{h\to 0} \dfrac{f(h)}{h} = 4$. Find $f'(x)$.

The remainder of this exam consists of **Multiple Choice** questions. **CIRCLE** the correct answer for each question. **No partial credit will be given.** (2 points each)

7. $\lim_{x\to+\infty} \dfrac{3x^5 - 2x^2 + 4}{7x^3 - 2x^5 - 9}$

(A) 0 **(B)** $+\infty$ **(C)** $-\dfrac{3}{2}$ **(D)** $\frac{3}{7}$ **(E)** None of the above

8. If $f(x) = \pi^2 - \pi^3 + \cos\pi - 1$, then $f'(x)$ is equal to

(A) $2\pi - 3\pi^2 - \sin\pi$ **(B)** 0 **(C)** $2\pi - 3\pi^2 + \sin\pi$ **(D)** $2\pi + 3\pi^2 + \sin\pi$ **(E)** None of the above

9. The graph of the function $f(x) = \sin x,\ -\pi \le x \le \pi$, has horizontal tangent lines at

(A) $x = \pm\dfrac{\pi}{4}$ **(B)** $x = \pm\pi$ **(C)** 0 **(D)** $x = \pm\dfrac{\pi}{2}$ **(E)** None of the above

10. To prove that $\lim_{x\to -1}(9x+1) = -8$, we must show that given any positive number ϵ, we can find a positive number δ such that

$$|x+1| < \delta \qquad \text{implies} \qquad |(9x+1)+8| < \epsilon.$$

To achieve this task, if $\epsilon = 0.05$ then δ can be taken as

(A) $\frac{1}{180}$ **(B)** $\frac{1}{45}$ **(C)** $\frac{2}{45}$ **(D)** $\frac{2}{9}$ **(E)** None of the above

11. Let $y = \cos x$. Then $\frac{d^{50}y}{dx^{50}}$ is equal to

(A) $-50\sin x$ **(B)** $-50\cos x$ **(C)** $\sin^{50} x$ **(D)** $\cos^{50} x$ **(E)** None of the above

12. Let $f(x) = \begin{cases} x, & x \geq 0 \\ x+1, & x < 0. \end{cases}$

Then

(A) f is differentiable everywhere
(B) f is differentiable everywhere except at $x = 0$
(C) f is differentiable everywhere except at $x = 1$
(D) f is differentiable everywhere except at $x = -1$
(E) None of the above

THE END OF THE TEST