SULTAN QABOOS UNIVERSITY
DEPARTMENT OF MATHEMATICS AND STATISTICS
6 March 2007

MATH 2107 CALCULUS I
TEST I version II
(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 for rough work and will not be marked**.
- Write your name, ID number and Section number at the top of each page.
- 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 use RED INK in your answer sheet.
- Please do NOT SEPARATE the pages of this booklet.

DO NOT WRITE ON THIS BOX!

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

1. (5 points) Find $\displaystyle\lim_{x\to 3} \frac{x^2 - 5x + 6}{x^3 - 27}$

2. (5 points) Let $f(x) = \dfrac{1}{x - 3}$. Use the **definition of the derivative** to find $f'(x)$

$\left(f'(x) = \displaystyle\lim_{h\to 0} \dfrac{f(x + h) - f(x)}{h} \right).$

3. (5 points) Let $y = \sec^4(3\sqrt{x} + x)$.

(a) Find $\dfrac{dy}{dx}$.

(b) Find $\dfrac{dy}{dx}\big|_{x=0}$, if it exists.

4. (5 points) Use an appropriate local linear approximation to estimate the value of $\sqrt[3]{64.1}$

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5. (4 points) Use the Intermediate Value Theorem to show that the equation $x^3 + x - 3 = 0$ has at least one solution in the interval $[1, 2]$.

6. (4 points) Show that the function $f(x) = |x - 2|$ is not differentiable at $x = 2$.

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. The graph of the function $y = \dfrac{6x + 1}{2x - 3}$ has a horizontal asymptote at:

   (A) $y = \frac{1}{3}$ **(B)** $y = 3$ **(C)** $y = -\frac{1}{3}$ **(D)** $y = -3$ **(E)** $x = 3$

8. $\lim\limits_{x \to 3} \pi =$

   (A) 3   **(B)** π **(C)** -3 **(D)** Does not exist   **(E)** $-\pi$

9. $\lim\limits_{x \to 4} \dfrac{x}{x - 4}$

   (A) 1   **(B)** 0   **(C)** Does not exist   **(D)** $+\infty$ **(E)** $-\infty$

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10. $\lim\limits_{x \to 0} \dfrac{1 - \cos x}{\sin x} =$

   (A) $+\infty$ **(B)** 0 **(C)** 1 **(D)** Does not exist   **(E)** None of the above

11. The equation of the tangent line to the curve $y = 3x$ at $x = 2$ is:

   (A) $y = 3$ **(B)** $y = 3 - 2x$ **(C)** $y = 3x + 2$ **(D)** $y = 3x$ **(E)** $y = 2$

12. Which of the following functions is **not continuous** at $x = 1$?

   (A) $f(x) = \begin{cases} \sin(\pi x), & \text{if } x \geq 1 \\ \cos(\pi x) + x, & \text{if } x < 1 \end{cases}$ **(B)** $f(x) = |x - 1|$ **(C)** $f(x) = \dfrac{x^2 - x}{x - 1}$

   (D) $f(x) = \sin(\dfrac{1}{x} - x)$ **(E)** None of the above

THE END OF THE TEST