King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics
Math 101 Major Quiz

Name : ..... **ID** #..... Serial #: .....

Question 1[4 points]: Use the Intermediate Value Theorem to show that the functions have an intersection point:

$$f(x) = e^{-x}, \quad and \quad g(x) = x^2.$$

Question 2[6 points]: Graph a function $y = f(x)$ with the following properties:

1. $\lim_{x\to\infty} f(x) = 2$.
2. $\lim_{x\to 4^+} f(x) = \infty$.
3. $f(4) = 2$.
4. f has a jump discontinuity at $x = 0$.
5. $f'(-2) = 0$.
6. $y = 0$ is a horizontal asymptote.

Question 3[4 points]: Find the following limits

1. $\lim_{x\to-\infty} \frac{4x^{2/3}-5x^{1/3}}{6x^{2/3}-7x^{1/3}}$

2. $\lim_{x\to 0}(\frac{1}{x} - \frac{\cos x}{x})$

Question 4[6 points]: Determine all asymptotes of the function

$$f(x) = \frac{|x^3 - 1|}{x^3 - x}$$