King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics
Math 101 (161) Sec 05 - Quiz 2

Name: ID: Serial No.:

1. Find the values of a and b that make the function

$$f(x) = \begin{cases} 3 & \text{if} \quad x = 1 \\ ax^2 - bx + 3 & \text{if} \quad 1 < x < 2 \\ 2x - a + b & \text{if} \quad 2 \leq x < 3 \\ 6 & \text{if} \quad x = 3 \end{cases}$$

continuous on the closed interval $[1, 3]$. (Use limits to justify your steps)

2. Given that $\lim_{x\to 2}\left(3x-\frac{2}{5}\right)=\frac{28}{5}$ and $\epsilon=0.009$. Find the largest possible value of δ that satisfies the conditions given in the $\epsilon-\delta$ definition of a limit.

3. Find the horizontal asymptotes of the graph of the function $f(x)=\arctan\dfrac{\sqrt{9x^2+2}}{3x+2}$

4. Use the Intermediate Value Theorem to show that the equation $\cos x = x^2$ has at least two real roots in the interval $(-\frac{\pi}{2}, \frac{\pi}{2})$.

5. Sketch the graph of a function f that satisfies all of the following conditions:
   $\lim_{x\to -4^-} f(x) = \infty; \quad \lim_{x\to -4^+} f(x) = -\infty; \quad \lim_{x\to -\infty} f(x) = -1$

   f has a removale discountuity at -2

   $\lim_{x\to 1^-} f(x) = -1; \quad \lim_{x\to 1^+} f(x) = 2; \quad f(1) = 1$