

Kingdom of Saudi Arabia

Ministry of Higher Education

Taibah University

Department of Applied Mathematics

**2<sup>nd</sup> Mid Term Examination Calculus 1- applied mathematics and statistics**

**Time: 90 minutes**

**Answer the following questions**

**Choose the correct answer:**

- The graph of a function  $f$  has a cusp line at the point  $P(1, f(1))$  if  $f$  is continuous at 1 and if
  - $f'(x) \rightarrow \infty$  as  $x$  approaches 1 from one side
  - $f'(x) \rightarrow -\infty$  as  $x$  approaches 1 from one side
  - $f'(x) \rightarrow \infty$  as  $x$  approaches 1 from one side and  $f'(x) \rightarrow -\infty$  as  $x$  approaches 1 from the other side
- If a function  $f$  is differentiable at  $a$  then
  - $f'(x)$  is continuous at  $a$
  - $f(x)$  is continuous at  $a$
  - $f(x)$  is discontinuous at  $a$
- If  $y = x^4 - x^3 - 3x$  then  $D_x^2 y = 0$  at
  - $x = \{0, 1\}$
  - $x = \{0, 1/2\}$
  - $x = \{1, 1/2\}$
- The first derivative of  $y = \sec^2 x$  is
  - $2 \sec x \tan x$
  - $2 \sec^2 x \tan x$
  - $2 \sec x \tan^2 x$
- If  $y = u^2$  and  $u = x^2 + 1$  then  $\frac{dy}{dx}$  equal
  - $2x(x^2 + 1)$
  - $4x(x^2 + 1)$
  - $8x(x^2 + 1)$

**Answer the following questions:**

- If  $f(x) = 3x^2 + 2$  find  $f'(x)$ ,  $f'(1)$  and the equation of tangent line to the graph at  $P(-1, 1)$
- Use the right hand and left hand derivative to prove that  $f(x) = |x - 1|$  is not differentiable at  $a = 1$
- If  $y = (3x + 1)^6 \sqrt{2x - 4}$  find  $D_x y$
- Find the slope of normal line to the graph  $x^2 y + \sin y = 0$  at  $P(1, 2\pi)$

5- Find the first derivative of  $f(x) = \frac{\cos 3x}{1+\tan 3x}$