

King Fahd University of Petroleum and Minerals  
Department of Mathematics and Statistics  
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Math - 132.1

Serial #: \_\_\_\_ St. Number: \_\_\_\_\_  
Name: \_\_\_\_\_  
Test No. 1 Date: 24-2-2016.

**Note: Show all your work. No credits for answers not supported by work.**

<b><u>Question No.</u></b>	<b><u>Mark</u></b>	<b><u>Obtained Mark</u></b>
Q1	24	
Q2	9	
Q3	9	
Q4	9	
Q5	9	
Q6	40	
<b>Total</b>	<b>100</b>	

**Problem 1: (24 points)** Find each of the following limits if it exists. Use  $\infty$  and/or  $-\infty$  when appropriate.

(a)  $\lim_{x \rightarrow 1} \frac{x^2 - x + 2}{x - 2x^3}$

(b)  $\lim_{x \rightarrow -3} \left[ \frac{x^2 - 2x - 15}{x + 3} \right]$

(c)  $\lim_{x \rightarrow -\infty} \frac{3 - 2x - e^x}{7 - 5x^3 + 4x^2}$

(d)  $\lim_{x \rightarrow 2^-} \frac{x + 1}{x^2 - 4}$

**Problem 2:** (9 points)

Find all values of  $A$  and  $B$  which will make the function continuous at  $x = 1$ .

$$f(x) = \begin{cases} 2Ax - 3 & \text{if } x < 2 \\ A + B & \text{if } x = 2 \\ x - B - 1 & \text{if } x > 2. \end{cases}$$

**Problem 3:** (9 points)

Use the definition of the derivative to find  $f'(3)$  for the function  $f(x) = x^2 - 2x$ .

**Problem 4:** (9 points)

The position function of a moving object is  $s = f(t) = t^2 + 2t + 5$ , where  $t$  is in seconds and  $s$  is in meters.

i. Find the average velocity over the interval  $[2, 2.1]$ .

ii. Find the velocity at  $t = 2$ .

**Problem 5:** (9 points)

Air is being pumped into a spherical balloon. Find the rate of change of the surface area  $S$  of the balloon with respect to the radius  $r$ , when  $r = 1.5 \text{ cm}$ . Also find the is the percentage rate of change. (Note that  $S = 4\pi r^2$ ).

**Problem 6: (40 points)**

(a) If  $y = \ln(\ln x) + \frac{x-2}{2x^3+1}$ , find  $y'$ .

(b) Find the slope of the line tangent to the graph of  $x^2y^3 - \ln y = 6x$  at the point (1,1).

(c) Find  $y^{(10)}$  for the function  $y = 3^{2x+1}$ .

(d) If  $y = (x^2 + 1)^3 \sqrt{\frac{x+4}{2x+1}}$ , find  $y'(0)$ .