

MATHS TEST  
(LIMITS AND DERIVATIVES)      FM-30  
TIME- 1HR

1. EVALUATE THE FOLLOWING LIMITS

- a.  $\lim_{x \rightarrow 0} \{(x+1)^5 - 1\}/x$  (2)
- b.  $\lim_{x \rightarrow 3} (x^4 - 81)/(2x^2 - 5x - 3)$  (2)
- c.  $\lim_{x \rightarrow -2} (1/x + 1/2)/(x+2)$  (2)
- d.  $\lim_{x \rightarrow 0} (\cos 2x - 1)/(\cos x - 1)$  (2)
- e.  $\lim_{x \rightarrow 0} (\sin ax + bx)/(ax + \sin bx)$   $a, b,$   
 $a + b \neq 0$  (2)

2. FIND THE DERIVATIVE (2)

- a.  $2/(x+1) - x^2/(3x-1)$

3. FIND THE DERIVATIVE OF  $f$  FROM THE FIRST PRINCIPLE, WHERE  $f$  IS GIVEN BY

- a.  $f(x) = (2x+3)/(x-2)$  (3)

4. FIND THE DERIVATIVE OF THE

FOLLOWING FUNCTIONS (its to be

understood that  $a, b, c, d, p, q, r$  and  $s$  are fixed non-zero constants and  $m$  and  $n$  are integers) (3x3=9)

- a.  $(ax+b)^n(cx+d)^m$
- b.  $(\sin x + \cos x)/(\sin x - \cos x)$
- c.  $x^4 (5\sin x - 3\cos x)$

5. FOR THE FUNCTION

$$f(x) = x^{100}/100 + x^{99}/99 + \dots + x^2/2 + x + 1$$

Prove that  $f'(1) = 100f'(0)$

(3)

6. Suppose

$$f(x) = a + bx, \quad x < 1$$

$$4, \quad x = 1$$

$$b - ax, \quad x > 1$$

and if  $\lim_{x \rightarrow -1} f(x) = f(1)$

what are the possible values of a and b ?

(3)