

## Derivatives

### worksheet-1

I(a) Find the values of the derivatives as specified.

1.  $f(x) = 4 - x^2$ ;  $f'(-3), f'(0), f'(1)$

2.  $F(x) = (x - 1)^2 + 1$ ;  $F'(-1), F'(0), F'(2)$

3.  $g(t) = \frac{1}{t^2}$ ;  $g'(-1), g'(2), g'(\sqrt{3})$

4.  $k(z) = \frac{1-z}{2z}$ ;  $k'(-1), k'(1), k'(\sqrt{2})$

5.  $p(\theta) = \sqrt{3\theta}$ ;  $p'(1), p'(3), p'(2/3)$

6.  $r(s) = \sqrt{2s+1}$ ;  $r'(0), r'(1), r'(1/2)$

I(b) Find the indicated derivatives.

7.  $\frac{dy}{dx}$  if  $y = 2x^3$

8.  $\frac{dr}{ds}$  if  $r = s^3 - 2s^2 + 3$

9.  $\frac{ds}{dt}$  if  $s = \frac{t}{2t+1}$

10.  $\frac{dv}{dt}$  if  $v = t - \frac{1}{t}$

11.  $\frac{dp}{dq}$  if  $p = q^{3/2}$

12.  $\frac{dz}{dw}$  if  $z = \frac{1}{\sqrt{w^2-1}}$

II(a) Find the first and second derivatives of the following functions

1.  $y = -x^2 + 3$

2.  $y = x^2 + x + 8$

3.  $s = 5t^3 - 3t^5$

4.  $w = 3z^7 - 7z^3 + 21z^2$

5.  $y = \frac{4x^3}{3} - x$

6.  $y = \frac{x^3}{3} + \frac{x^2}{2} + \frac{x}{4}$

7.  $w = 3z^{-2} - \frac{1}{z}$

8.  $s = -2t^{-1} + \frac{4}{t^2}$

9.  $y = 6x^2 - 10x - 5x^{-2}$

10.  $y = 4 - 2x - x^{-3}$

11.  $r = \frac{1}{3s^2} - \frac{5}{2s}$

12.  $r = \frac{12}{\theta} - \frac{4}{\theta^3} + \frac{1}{\theta^4}$

II(b) Find the derivatives of the following functions

13.  $y = (3 - x^2)(x^3 - x + 1)$  14.  $y = (2x + 3)(5x^2 - 4x)$

15.  $y = (x^2 + 1)\left(x + 5 + \frac{1}{x}\right)$  16.  $y = (1 + x^2)(x^{3/4} - x^{-3})$

17.  $y = \frac{2x + 5}{3x - 2}$

18.  $z = \frac{4 - 3x}{3x^2 + x}$

19.  $g(x) = \frac{x^2 - 4}{x + 0.5}$

20.  $f(t) = \frac{t^2 - 1}{t^2 + t - 2}$

21.  $v = (1 - t)(1 + t^2)^{-1}$

22.  $w = (2x - 7)^{-1}(x + 5)$

23.  $f(s) = \frac{\sqrt{s} - 1}{\sqrt{s} + 1}$

24.  $u = \frac{5x + 1}{2\sqrt{x}}$

25.  $v = \frac{1 + x - 4\sqrt{x}}{x}$

26.  $r = 2\left(\frac{1}{\sqrt{\theta}} + \sqrt{\theta}\right)$

27.  $y = \frac{1}{(x^2 - 1)(x^2 + x + 1)}$

28.  $y = \frac{(x + 1)(x + 2)}{(x - 1)(x - 2)}$

III(a) Find the first derivative of the following functions

1.  $y = -10x + 3 \cos x$

2.  $y = \frac{3}{x} + 5 \sin x$

3.  $y = x^2 \cos x$

4.  $y = \sqrt{x} \sec x + 3$

5.  $y = \csc x - 4\sqrt{x} + 7$

6.  $y = x^2 \cot x - \frac{1}{x^2}$

7.  $f(x) = \sin x \tan x$

8.  $g(x) = \frac{\cos x}{\sin^2 x}$

9.  $y = x \sec x + \frac{1}{x}$

10.  $y = (\sin x + \cos x) \sec x$

11.  $y = \frac{\cot x}{1 + \cot x}$

12.  $y = \frac{\cos x}{1 + \sin x}$

III(b) Find the first derivative of the following functions

1.  $y = 6u - 9, \quad u = (1/2)x^4$     2.  $y = 2u^3, \quad u = 8x - 1$   
3.  $y = \sin u, \quad u = 3x + 1$     4.  $y = \cos u, \quad u = -x/3$   
5.  $y = \sqrt{u}, \quad u = \sin x$     6.  $y = \sin u, \quad u = x - \cos x$   
7.  $y = \tan u, \quad u = \pi x^2$     8.  $y = -\sec u, \quad u = \frac{1}{x} + 7x$
9.  $y = (2x + 1)^5$     10.  $y = (4 - 3x)^9$   
11.  $y = \left(1 - \frac{x}{7}\right)^{-7}$     12.  $y = \left(\frac{\sqrt{x}}{2} - 1\right)^{-10}$   
13.  $y = \left(\frac{x^2}{8} + x - \frac{1}{x}\right)^4$     14.  $y = \sqrt{3x^2 - 4x + 6}$   
15.  $y = \sec(\tan x)$     16.  $y = \cot\left(\pi - \frac{1}{x}\right)$   
17.  $y = \tan^3 x$     18.  $y = 5 \cos^{-4} x$