

U2H7

1. Find  $\frac{dp}{dt}$  if  $p = t^3 + 6t^2 - \frac{5}{3}t + 16$ .

2. Find the first four derivatives of  $y = x^3 - 5x^2 + 2$ .

3. Does the curve  $y = x^4 - 2x^2 + 2$  have any horizontal tangents? If so, where?

4. If  $u = x^2 + 1$  and  $v = x^3 + 3$ , and  $f(x) = uv$ , find  $f'(x)$ .

5. Let  $y = uv$  be the product of the functions  $u$  and  $v$ . Find  $y'(2)$  if  $u(2) = 3$ ,  $u'(2) = 4$ ,  $v(2) = 1$ ,  $v'(2) = 2$ .

6. Suppose  $u$  and  $v$  are functions of  $x$  that are differentiable at  $x = 0$  and that  $u(0) = 5$ ,  $u'(0) = -3$ ,  $v(0) = -1$ ,  $v'(0) = 2$ . Find the values of the following derivatives at  $x = 0$ .

a.  $\frac{d}{dx}(uv)$

b.  $\frac{d}{dx}\left(\frac{u}{v}\right)$

c.  $\frac{d}{dx}\left(\frac{v}{u}\right)$

d.  $\frac{d}{dx}(7v - 2u)$

For 7-8, find the derivative by (a) applying the power rule and (b) applying the product rule (c) do parts a = b?

7.  $y = (3 - x^2)(-x + 1)$

8.  $y = \left(x + \frac{1}{x}\right)\left(x - \frac{1}{x}\right)$

a.

a.

b.

b.

c.

c.

9. Find an equation for the line tangent to the curve at the given point.  $y = \frac{x^3 + 1}{2x}$ ,  $x = 1$

For exercises 10-11, find  $\frac{dy}{dx}$ .

10.  $y = \frac{\sqrt{x} - 1}{\sqrt{x} + 1}$

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

## Answers

1.  $\frac{dp}{dt} = 3t^2 + 12t - \frac{5}{3}$

1.  $y' = 3x^2 - 10x$

$y'' = 6x - 10$

2.  $y''' = 6$

$y'''' = 0$

3.  $x = 0, 1, -1$

4.  $f'(x) = (x^2 + 1)(3x^2) + (x^3 + 3)(2x)$

5. 10

6. a. 13

b. -7

c.  $\frac{7}{25}$

d. 20

7. a.  $-3 + 3x^2 - 2x$

b. c. yes

8. a.  $2x + \frac{2}{x^3}$

b. c. yes

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

10.  $\frac{dy}{dx} = \frac{(x^{1/2} + 1)(\frac{1}{2}x^{-1/2}) - (x^{1/2} - 1)(\frac{1}{2}x^{-1/2})}{(x^{1/2} + 1)^2}$

11.  $\frac{dy}{dx} = \frac{(x^2)(4x^3) - (x^4 + 2)(2x)}{(x^2)^2}$