

# MCV4U Derivative Practice

6. Determine the derivative of each function.

(a)  $f(x) = (2x - 5)^3(3x^2 + 4)^5$       (b)  $g(x) = (8x^3)(4x^2 + 2x - 3)^5$

(c)  $y = (5 + x)^2(4 - 7x)^6$

(e)  $y = \frac{(2x^2 - 5)^3}{(x + 8)^2}$

(g)  $g(x) = \left(\frac{2x + 5}{6 - x^2}\right)^4$

(i)  $h(x) = \frac{-4\sqrt{3x + 2}}{(2x - x^2)^2}$

(k)  $f(x) = [2x + (3x^2 - 5x)^3]^5$

7. (a) Let  $y = \frac{\sqrt{x}}{\sqrt{x + 1}}$ . Determine  $\frac{dy}{dx}$ .      (b) Let  $y = \frac{\sqrt{2x + 1}}{\sqrt{x + 3}}$ . Determine  $\frac{dy}{dx}$ .

8. For  $y = 3(x - [x - 3(x + 2)^2]^{-1})$ , determine  $\frac{dy}{dx}$ .

9. Knowledge and Understanding: Let  $s = 3 - 2t - [t^{-2} - (3t + 5)^4]^5$ . Determine  $\frac{ds}{dt}$ .

11. Given  $f(t) = \left(\frac{\sqrt{1 - 2t}}{1 + t^2}\right)^2$ , determine  $f'(0)$ .

12. Let  $y = -2(x + [2x - 5(x - 2)^3]^{-1})$ . Determine  $\frac{dy}{dx}$ .

13. Given  $f(x) = 3x - 1$  and  $g(x) = \sqrt{[f(x)]^2 - 1}$ , determine  $g'(x)$ .

14. Find the equation of the tangent line to the curve  $y = 4x^2(3x^2 - 5x)^3$  at point (2, 128).

(a)  $2\sqrt{12x + 11}$   
 (b)  $\frac{2(2x + 11)^{-1/2} + 5(2x + 11)^{-3/2}}{5}$   
 (c)  $\frac{2(2x + 11)^{-1/2} + 5(2x + 11)^{-3/2}}{5}$   
 (d)  $\frac{13 + 5t^2}{6 - 9t + 2t^2}$   
 (e)  $\frac{3t^2 + 11t^2 + 4t + 16}{1t + 8t^2}$   
 (f)  $\frac{8t^2 + 16t + 9}{5t^2 + 16t + 9}$   
 (g)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (h)  $\frac{4x - 2t^2}{16 - 12t + 4t^2}$   
 (i)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (j)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (k)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (l)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (m)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (n)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (o)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (p)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (q)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (r)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (s)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (t)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (u)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (v)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (w)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (x)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (y)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (z)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$

Differentiate the functions defined in Exercises 1-26.

1  $f(x) = \sqrt[3]{x^3 + 4\sqrt{x^3}}$       2  $f(x) = 10\sqrt[3]{x^3 + \sqrt[3]{x^3}}$

3  $k(r) = \sqrt[3]{8r^3 + 27}$       4  $h(z) = (2z^2 - 9z + 8)^{-2/3}$

5  $F(u) = 5\sqrt[3]{u^3 - 32}$       6  $k(s) = 1/\sqrt[3]{3s - 4}$

7  $f(x) = \sqrt[3]{1x}$       8  $g(x) = \sqrt[3]{1x}$

9  $f(z) = 10\sqrt[3]{z^3 + 3\sqrt[3]{z}}$       10  $f(t) = \sqrt[3]{t^3 - (1/\sqrt[3]{t^3})}$

11  $g(w) = (w^2 - 4w + 3)/w^{3/2}$       12  $K(x) = 8x^2\sqrt{x} + 3x\sqrt[3]{x}$

13  $M(x) = \sqrt{4x^2 - 7x + 4}$       14  $F(s) = \sqrt[3]{3s - 8}$

15  $f(t) = 4/(9t^2 + 16)^{2/3}$       16  $k(u) = 1/\sqrt[3]{u^4 + 7u^3}$

17  $H(u) = \sqrt{\frac{3u + 8}{2u + 5}}$       18  $G(x) = \left(\frac{x}{x^2 + 1}\right)^{5/2}$

19  $k(s) = \sqrt[3]{s^3 + 9(4s + 5)^4}$       20  $g(y) = (15y + 2)(y^2 - 2)^{3/4}$

21  $h(x) = (x^2 + 4)^{5/3}(x^3 + 1)^{3/5}$       22  $f(w) = \sqrt{w^2(9w + 1)^5}$

23  $g(z) = \sqrt[3]{2z + 3} + \sqrt[3]{3z + 2}$       24  $H(x) = \frac{2x + 3}{\sqrt{4x^2 + 9}}$

25  $f(x) = (7x + \sqrt{x^2 + 3})^6$       26  $\rho(z) = [1 + (1 + 2z)^{1/2}]^{1/2}$

In each of Exercises 27-30 find an equation of the tangent line to the graph of the equation at the point P.

27  $y = \sqrt{2x^2 + 1}$ ,  $P(1, \sqrt{3})$       28  $y = (5x - 8)^{1/3}$ ,  $P(7, 3)$

29  $y = 4x^{2/3} + 2x^{-1/3} - 10$ ,  $P(-8, 5)$       30  $y = 4x/\sqrt{x + 1}$ ,  $P(3, 6)$

31 Find the point P on the graph of  $y = \sqrt{2x - 4}$  such that the tangent line at P passes through the origin.

32 Find the points on the graph of  $y = x^{5/3} + x^{1/3}$  at which the tangent line is perpendicular to the line  $2y + x = 7$ .

(a)  $62x - 5\sqrt[3]{3x^2} + 4\sqrt[3]{13x^2} - 25x + 4$   
 (b)  $\frac{8x^2 + 16x + 9}{5x^2 + 16x + 9}$   
 (c)  $2(5 + x)K - 7x^2(70x^2 - 315x^2 + 4)$   
 (d)  $\frac{13 + 5t^2}{6 - 9t + 2t^2}$   
 (e)  $\frac{1t + 8t^2}{3t^2 + 5t^2 + 3t^2 + 2t}$   
 (f)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (g)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (h)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (i)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
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 (t)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (u)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (v)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (w)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (x)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (y)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$   
 (z)  $\frac{16 - 2t^2}{8t^2 + 5t^2 + 3t^2 + 2t}$