

MCV 4U Derivative Practice

Differentiate the functions defined in Exercises 1–26.

1. $f(x) = \sqrt[3]{x^2} + 4\sqrt{x^3}$
 2. $f(x) = 10\sqrt[3]{x^3} + \sqrt[3]{x^3}$
 3. $k(r) = \sqrt[3]{8r^3 + 27}$
 4. $h(z) = (2z^2 - 9z + 8)^{-1/3}$
 5. $F(v) = 5/\sqrt[3]{v^5 - 32}$
 6. $k(s) = 1/\sqrt{3s - 4}$
 7. $f(x) = \sqrt{2x}$
 8. $g(x) = \sqrt[3]{1/x}$
 9. $f(z) = 10\sqrt{z^3} + 3\sqrt[3]{z}$
 10. $f(t) = \sqrt[3]{t^2} - (1/\sqrt{t^3})$
 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. $F(s) = \sqrt[3]{5s - 8}$
 15. $f(t) = 4/(9t^2 + 16)^{1/3}$
 16. $k(u) = 1/\sqrt{(u^4 + 7u^2)^3}$
 17. $H(u) = \sqrt{\frac{3u + 8}{2u + 5}}$
 18. $G(x) = \left(\frac{x}{x^2 + 4}\right)^{1/2}$
 19. $k(s) = \sqrt[3]{s^2 + 9(4s + 5)^4}$
 20. $g(y) = (15y + 2)(y^2 - 2)^{3/4}$
 21. $h(x) = (x^2 + 4)^{5/3}(x^3 + 1)^{1/3}$
 22. $f(w) = \sqrt{w^3(9w + 1)^3}$
 23. $g(z) = \frac{\sqrt{2z + 3}}{\sqrt{3z + 2}}$
 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. $y = (5x - 8)^{1/3}$
 29. $y = 4x^{3/2} + 2x^{-1/3} - 10$, $P(-8, 5)$
 30. $y = 4x/\sqrt{x + 1}$, $P(1, 6)$
 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 $2y + x = 7$.
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) $y = (5 + x)^2(4 - 7x^3)^6$
 - (d) $h(x) = \frac{6x - 1}{(3x + 5)^4}$
 - (e) $y = \frac{(2x^2 - 5)^3}{(x + 8)^2}$
 - (f) $f(x) = \frac{-3x^4}{\sqrt{4x - 8}}$
 - (g) $y = \left[\frac{1}{(4x + x^2)^3} \right]^3$
 - (h) $y = \sqrt{\frac{x^2 + 1}{x^2 - 1}}$
 - (i) $y = \sqrt{\frac{x^2 + 8}{2u + 5}}$
 - (j) $g(x) = \sqrt{2x + \sqrt{x^3}}$
 - (k) $f(x) = [2x + (3x^2 - 5x)^3]^5$
 - (l) $g(x) = \frac{\sqrt{2x + 1}}{\sqrt{x + 3}}$. Let $y = \frac{\sqrt{2x + 1}}{\sqrt{x + 3}}$. Determine $\frac{dy}{dx}$.
 - (m) Let $y = \frac{\sqrt{x}}{\sqrt{x + 1}}$. Determine $\frac{dy}{dx}$.
 - (n) Let $y = 3(x - 3(x + 2)^2)^{-1}$. determine $\frac{dy}{dx}$.
 - (o) 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 $\frac{ds}{dt}$.
 10. Given $f(t) = \left(\frac{\sqrt[3]{1 - 2t}}{1 + t^2}\right)^2$, determine $f'(0)$.
 11. Given $f(t) = \left(\frac{\sqrt[3]{1 - 2t}}{1 + t^2}\right)^2$, 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 $(2, 128)$.
 15. $y = 1472x - 2816$
 16. $y = \frac{1}{2}x^2 - 5x^2 - 5x^3 + 5x^4 - 2x^5 - 12(3x - 5)^3$
 17. $H(u) = -1/2\sqrt{3u + 8}(2u + 5)$
 18. $y = \frac{16 - x^2}{x^2 + 4}$
 19. $A(s) = \frac{9x^2}{s^2} + \frac{3}{s^3} + \frac{3}{s^4} + \frac{3}{s^5} + \frac{3}{s^6} + \frac{3}{s^7} + \frac{3}{s^8} + \frac{3}{s^9} + \frac{3}{s^{10}}$
 20. $A(x) = \frac{9x^2}{x^2} + \frac{3}{x^3} + \frac{3}{x^4} + \frac{3}{x^5} + \frac{3}{x^6} + \frac{3}{x^7} + \frac{3}{x^8} + \frac{3}{x^9} + \frac{3}{x^{10}}$
 21. $H(x) = \frac{9x^2}{x^2} + \frac{3}{x^3} + \frac{3}{x^4} + \frac{3}{x^5} + \frac{3}{x^6} + \frac{3}{x^7} + \frac{3}{x^8} + \frac{3}{x^9} + \frac{3}{x^{10}}$
 22. $y = \frac{8}{x^2} - 5x^2 - 32x^3 - 70x^4 - 15x^5 - 16x^6 - 48x^7 - 16x^8 - 16x^9 - 16x^{10}$
 23. $y = \frac{8x^2 - 7x^3 - 32x^4 - 70x^5 - 15x^6 - 16x^7 - 48x^8 - 16x^9 - 16x^{10}}{x^2}$
 24. $y = \frac{8x^2 - 7x^3 - 32x^4 - 70x^5 - 15x^6 - 16x^7 - 48x^8 - 16x^9 - 16x^{10}}{x^2}$
 25. $y = \frac{8x^2 - 7x^3 - 32x^4 - 70x^5 - 15x^6 - 16x^7 - 48x^8 - 16x^9 - 16x^{10}}{x^2}$
 26. $y = \frac{8x^2 - 7x^3 - 32x^4 - 70x^5 - 15x^6 - 16x^7 - 48x^8 - 16x^9 - 16x^{10}}{x^2}$
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