

Assignment

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Differentiate each function with respect to the given variable.

1) $y = 3s^{\frac{5}{7}}$

2) $g(x) = -\frac{3}{x} + 3x^{-8}$

3) $f(w) = -1 + \frac{4}{w^7}$

4) $h(s) = -\frac{2}{s} + 5s^{-6}$

5) $f(r) = -3\sqrt[7]{r^4} + 4 + 5r^{-3}$

6) $h(t) = -5$

7) $f(t) = \sqrt[8]{t^5} - 5t^{-9}$

8) $g(s) = 2\sqrt[7]{s^3} - 4s^{-3} - \frac{5}{s^6}$

9) $g(x) = 3\sqrt[10]{x^3} - x^{-1} - 2x^{-10}$

10) $y = 4r^7 + 3r^6$

Differentiate each function with respect to x .

11) $f(x) = \left(-3x^2 - x^{\frac{4}{3}} + 2\right)(5x^3 - 3)$

12) $y = (-3x^4 - 2 - 2x^{-2})(-3x^2 + 1)$

13) $y = (-2x^3 - 4\sqrt[3]{x} - 5)(-x^3 + 1)$

14) $y = (2x^2 - 5 - x^{-2})(-x^2 + 1)$

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

16) $f(x) = \frac{3}{2\sqrt[3]{x} - 2}$

$$17) y = \frac{5x^4 - 3x^3}{2 - \frac{5}{x^3}}$$

$$18) y = \frac{3}{4 + \frac{3}{x^2}}$$

$$19) y = \frac{3x^5 + 4x^3 + 3x^2}{4 + 2x^{-5}}$$

$$20) f(x) = \frac{4x^5 - 2x^2}{3 + 2x^{-3}}$$

For each problem, you are given a table containing some values of differentiable functions $f(x)$, $g(x)$ and their derivatives. Use the table data and the rules of differentiation to solve each problem.

21)

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	3	-1	4	-2
2	2	-1	2	$-\frac{3}{2}$
3	1	$\frac{1}{2}$	1	0
4	3	2	2	1

 Given $h(x) = f(x) + g(x)$, find $h'(4)$

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	3	-1	4	-2
2	2	-1	2	$-\frac{3}{2}$
3	1	$\frac{1}{2}$	1	0
4	3	2	2	1

22)

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	4	-2	1	1
2	2	$-\frac{3}{2}$	2	$\frac{3}{2}$
3	1	$\frac{1}{2}$	4	0
4	3	2	2	-2

 Given $h(x) = f(x) - g(x)$, find $h'(2)$

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	4	-2	1	1
2	2	$-\frac{3}{2}$	2	$\frac{3}{2}$
3	1	$\frac{1}{2}$	4	0
4	3	2	2	-2

23)

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	2	2	4	-1
2	4	$\frac{1}{2}$	3	$-\frac{3}{2}$
3	3	-1	1	0
4	2	-1	3	2

 Given $h(x) = f(x) \cdot g(x)$, find $h'(1)$

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	2	2	4	-1
2	4	$\frac{1}{2}$	3	$-\frac{3}{2}$
3	3	-1	1	0
4	2	-1	3	2

24)

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	1	1	2	1
2	2	1	3	1
3	3	1	4	$-\frac{1}{2}$
4	4	1	2	-2

 Given $h(x) = \frac{f(x)}{g(x)}$, find $h'(3)$

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	1	1	2	1
2	2	1	3	1
3	3	1	4	$-\frac{1}{2}$
4	4	1	2	-2

Assignment

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Differentiate each function with respect to the given variable.

1) $y = 3s^{\frac{5}{7}}$

$$\begin{aligned}\frac{dy}{ds} &= \frac{15}{7}s^{-\frac{2}{7}} \\ &= \frac{15}{7s^{\frac{2}{7}}}\end{aligned}$$

2) $g(x) = -\frac{3}{x} + 3x^{-8}$

$$\begin{aligned}g'(x) &= 3x^{-2} - 24x^{-9} \\ &= \frac{3}{x^2} - \frac{24}{x^9}\end{aligned}$$

3) $f(w) = -1 + \frac{4}{w^7}$

$$\begin{aligned}f'(w) &= -28w^{-8} \\ &= -\frac{28}{w^8}\end{aligned}$$

4) $h(s) = -\frac{2}{s} + 5s^{-6}$

$$\begin{aligned}h'(s) &= 2s^{-2} - 30s^{-7} \\ &= \frac{2}{s^2} - \frac{30}{s^7}\end{aligned}$$

5) $f(r) = -3\sqrt[7]{r^4} + 4 + 5r^{-3}$

$$\begin{aligned}f'(r) &= -\frac{12}{7}r^{-\frac{3}{7}} - 15r^{-4} \\ &= -\frac{12}{7r^{\frac{3}{7}}} - \frac{15}{r^4}\end{aligned}$$

6) $h(t) = -5$

$$h'(t) = 0$$

7) $f(t) = \sqrt[8]{t^5} - 5t^{-9}$

$$\begin{aligned}f'(t) &= \frac{5}{8}t^{-\frac{3}{8}} + 45t^{-10} \\ &= \frac{5}{8t^{\frac{3}{8}}} + \frac{45}{t^{10}}\end{aligned}$$

8) $g(s) = 2\sqrt[7]{s^3} - 4s^{-3} - \frac{5}{s^6}$

$$\begin{aligned}g'(s) &= \frac{6}{7}s^{-\frac{4}{7}} + 12s^{-4} + 30s^{-7} \\ &= \frac{6}{7s^{\frac{4}{7}}} + \frac{12}{s^4} + \frac{30}{s^7}\end{aligned}$$

$$9) g(x) = 3\sqrt[10]{x^3} - x^{-1} - 2x^{-10}$$

$$\begin{aligned} g'(x) &= \frac{9}{10}x^{-\frac{7}{10}} + x^{-2} + 20x^{-11} \\ &= \frac{9}{10x^{\frac{7}{10}}} + \frac{1}{x^2} + \frac{20}{x^{11}} \end{aligned}$$

$$10) y = 4r^7 + 3r^6$$

$$\frac{dy}{dr} = 28r^6 + 18r^5$$

Differentiate each function with respect to x .

$$11) f(x) = \left(-3x^2 - x^{\frac{4}{3}} + 2\right)(5x^3 - 3)$$

$$\begin{aligned} f'(x) &= \left(-3x^2 - x^{\frac{4}{3}} + 2\right) \cdot 15x^2 + (5x^3 - 3) \left(-6x - \frac{4}{3}x^{\frac{1}{3}}\right) \\ &= -75x^4 - \frac{65x^{\frac{10}{3}}}{3} + 30x^2 + 18x + 4x^{\frac{1}{3}} \end{aligned}$$

$$12) y = (-3x^4 - 2 - 2x^{-2})(-3x^2 + 1)$$

$$\begin{aligned} \frac{dy}{dx} &= (-3x^4 - 2 - 2x^{-2}) \cdot -6x + (-3x^2 + 1)(-12x^3 + 4x^{-3}) \\ &= 54x^5 - 12x^3 + 12x + \frac{4}{x^3} \end{aligned}$$

$$13) y = (-2x^3 - 4\sqrt[3]{x} - 5)(-x^3 + 1)$$

$$\begin{aligned} \frac{dy}{dx} &= \left(-2x^3 - 4x^{\frac{1}{3}} - 5\right) \cdot -3x^2 + (-x^3 + 1) \left(-6x^2 - \frac{4}{3}x^{-\frac{2}{3}}\right) \\ &= 12x^5 + \frac{40x^{\frac{7}{3}}}{3} + 9x^2 - \frac{4}{3x^{\frac{2}{3}}} \end{aligned}$$

$$14) y = (2x^2 - 5 - x^{-2})(-x^2 + 1)$$

$$\begin{aligned} \frac{dy}{dx} &= (2x^2 - 5 - x^{-2}) \cdot -2x + (-x^2 + 1)(4x - -2x^{-3}) \\ &= -8x^3 + 14x + \frac{2}{x^3} \end{aligned}$$

$$15) f(x) = (-2\sqrt[4]{x} - 4)(-2x^3 + 2x^2 + 3)$$

$$\begin{aligned} f'(x) &= \left(-2x^{\frac{1}{4}} - 4\right)(-6x^2 + 4x) + (-2x^3 + 2x^2 + 3) \cdot -\frac{1}{2}x^{-\frac{3}{4}} \\ &= 13x^{\frac{9}{4}} + 24x^2 - 9x^{\frac{5}{4}} - 16x - \frac{3}{2x^{\frac{3}{4}}} \end{aligned}$$

$$16) f(x) = \frac{3}{2\sqrt[3]{x} - 2}$$

$$\begin{aligned} f'(x) &= -\frac{3 \cdot \frac{2}{3}x^{-\frac{2}{3}}}{\left(2x^{\frac{1}{3}} - 2\right)^2} \\ &= -\frac{1}{2x^{\frac{4}{3}} - 4x + 2x^{\frac{2}{3}}} \end{aligned}$$

$$17) y = \frac{5x^4 - 3x^3}{2 - \frac{5}{x^3}}$$

$$\frac{dy}{dx} = \frac{(2 - 5x^{-3})(20x^3 - 9x^2) - (5x^4 - 3x^3) \cdot 15x^{-4}}{(2 - 5x^{-3})^2}$$

$$= \frac{40x^9 - 18x^8 - 175x^6 + 90x^5}{4x^6 - 20x^3 + 25}$$

$$18) y = \frac{3}{4 + \frac{3}{x^2}}$$

$$\frac{dy}{dx} = -\frac{3 \cdot -6x^{-3}}{(4 + 3x^{-2})^2}$$

$$= \frac{18x}{16x^4 + 24x^2 + 9}$$

$$19) y = \frac{3x^5 + 4x^3 + 3x^2}{4 + 2x^{-5}}$$

$$\frac{dy}{dx} = \frac{(4 + 2x^{-5})(15x^4 + 12x^2 + 6x) - (3x^5 + 4x^3 + 3x^2) \cdot -10x^{-6}}{(4 + 2x^{-5})^2}$$

$$= \frac{30x^{14} + 24x^{12} + 12x^{11} + 30x^9 + 32x^7 + 21x^6}{8x^{10} + 8x^5 + 2}$$

$$20) f(x) = \frac{4x^5 - 2x^2}{3 + 2x^{-3}}$$

$$f'(x) = \frac{(3 + 2x^{-3})(20x^4 - 4x) - (4x^5 - 2x^2) \cdot -6x^{-4}}{(3 + 2x^{-3})^2}$$

$$= \frac{60x^{10} + 52x^7 - 20x^4}{9x^6 + 12x^3 + 4}$$

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 Given $h(x) = f(x) + g(x)$, find $h'(4)$

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	3	-1	4	-2
2	2	-1	2	$-\frac{3}{2}$
3	1	$\frac{1}{2}$	1	0
4	3	2	2	1

$$h'(4) = 3$$

22)

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	4	-2	1	1
2	2	$-\frac{3}{2}$	2	$\frac{3}{2}$
3	1	$\frac{1}{2}$	4	0
4	3	2	2	-2

 □ □ Given $h(x) = f(x) - g(x)$, find $h'(2)$ □ □ □ □ □ □ □ □ □ □

$h'(2) = -3$

23)

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	2	2	4	-1
2	4	$\frac{1}{2}$	3	$-\frac{3}{2}$
3	3	-1	1	0
4	2	-1	3	2

 □ □ Given $h(x) = f(x) \cdot g(x)$, find $h'(1)$ □ □ □ □ □ □ □ □ □ □

$h'(1) = 6$

24)

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	1	1	2	1
2	2	1	3	1
3	3	1	4	$-\frac{1}{2}$
4	4	1	2	-2

 □ □ Given $h(x) = \frac{f(x)}{g(x)}$, find $h'(3)$ □ □ □ □ □ □ □ □ □ □

$h'(3) = \frac{11}{32}$