Differentiating a Variety of Functions ... (set 2)

Differentiate each function with respect to the given variable.

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

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

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

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

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

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

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

Differentiating a Variety of Functions … (set 2)

Answers

Differentiate each function with respect to the given variable.

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

$$\frac{dy}{ds} = \frac{15}{7}s^{-\frac{2}{7}}$$
$$= \frac{15}{7s^{\frac{2}{7}}}$$

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

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

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

$$f'(w) = -28w^{-8}$$
$$= -\frac{28}{w^8}$$

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

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

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

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

6) $h(t) = -5$

$$h'(t) = 0$$

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

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

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

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

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

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

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

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

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Differentiating a Variety of Functions ... (set 2)

Differentiate each function with respect to x.

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

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

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

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

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

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

Answers

Differentiate each function with respect to x.

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

$f'(x) = \left(-3x^2 - x^{\frac{4}{3}} + 2\right) \cdot 15x^2 + \left(5x^3 - 3\right)\left(-6x - \frac{4}{3}x^{\frac{1}{3}}\right)$

$= -75x^4 - \frac{65x^{\frac{10}{3}}}{3} + 30x^2 + 18x + 4x^{\frac{1}{3}}$

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

$\frac{dy}{dx} = \left(-3x^4 - 2 - 2x^{-2}\right) \cdot -6x + \left(-3x^2 + 1\right)\left(-12x^3 + 4x^{-3}\right)$

$= 54x^5 - 12x^3 + 12x + \frac{4}{x^3}$

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

$\frac{dy}{dx} = \left(-2x^3 - 4x^{\frac{1}{3}} - 5\right) \cdot -3x^2 + \left(-x^3 + 1\right)\left(-6x^2 - \frac{4}{3}x^{-\frac{2}{3}}\right)$

$= 12x^5 + \frac{40x^{\frac{7}{3}}}{3} + 9x^2 - \frac{4}{3x^{\frac{2}{3}}}$

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

$\frac{dy}{dx} = \left(2x^2 - 5 - x^{-2}\right) \cdot -2x + \left(-x^2 + 1\right)\left(4x - -2x^{-3}\right)$

$= -8x^3 + 14x + \frac{2}{x^3}$

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

$f'(x) = \left(-2x^{\frac{1}{4}} - 4\right)\left(-6x^2 + 4x\right) + \left(-2x^3 + 2x^2 + 3\right) \cdot -\frac{1}{2}x^{-\frac{3}{4}}$

$= 13x^{\frac{9}{4}} + 24x^2 - 9x^{\frac{5}{4}} - 16x - \frac{3}{2x^{\frac{3}{4}}}$

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

$f'(x) = -\dfrac{3 \cdot \frac{2}{3}x^{-\frac{2}{3}}}{\left(2x^{\frac{1}{3}} - 2\right)^2}$

$= -\dfrac{1}{2x^{\frac{4}{3}} - 4x + 2x^{\frac{2}{3}}}$

Differentiating a Variety of Functions ... (set 2)

Differentiate each function with respect to x.

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

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

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

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

Answers

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

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

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

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

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

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

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

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

Differentiating a Variety of Functions … (set 2)

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	$-\dfrac{3}{2}$
3	1	$\dfrac{1}{2}$	1	0
4	3	2	2	1

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

22)

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

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

23)

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

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

24)

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

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

Differentiating a Variety of Functions … (set 2)

Answers

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	$-\dfrac{3}{2}$
3	1	$\dfrac{1}{2}$	1	0
4	3	2	2	1

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

$h'(4) = 3$

22)

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

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

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