Calculus

Basic Differentiation Rules Day 2

Differentiate each function with respect to *x*.

1) $f(x) = 2x^{\frac{4}{3}} - \frac{4}{x^3}$

2) $f(x) = 3x^2 + \sqrt[5]{x^2} - 5\sqrt[5]{x}$

3) $f(x) = \frac{2}{x^3}$

4) $f(x) = 2$

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

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

7) $f(x) = 3x^{\frac{1}{5}} - \frac{2}{x^2}$

8) $f(x) = 4x^{\frac{1}{4}} + 2 + 3x^{-2}$

9) $f(x) = 4x^{\frac{4}{5}} + \frac{4}{x^5}$

10) $f(x) = -x^{-2}$

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

12) $f(x) = \sqrt[3]{x^2} - 4x^{\frac{1}{3}} - \frac{1}{x}$

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

14) $f(x) = \sqrt[5]{x} - 5x^{-3}$

15) $f(x) = 5$

16) $f(x) = \frac{1}{x} + 3x^{-2}$

For each problem, find the average rate of change of the function over the given interval.

17) $y = x^2 + 2x + 1;\ \ [-3, -2]$

18) $y = -2x^2 + 2;\ \ [-1, 0]$

19) $y = -x^2 - 2x + 1;\ \ [-1, 0]$

20) $y = 2x^2 + 2x - 2;\ \ [-2, -1]$

For each problem, find the instantaneous rate of change of the function at the given value.

21) $y = -x^2 - 2x + 2;\ \ -1$

22) $y = -x^2 + 2;\ \ 2$

23) $y = x^2 + 1;\ \ 1$

24) $y = 2x^2 - 2;\ \ -1$

Answers to Basic Differentiation Rules Day 2

1) $f'(x) = \frac{8x^{\frac{1}{3}}}{3} + \frac{12}{x^4}$

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

3) $f'(x) = -\frac{6}{x^4}$

4) $f'(x) = 0$

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

6) $f'(x) = \frac{8}{5x^{\frac{1}{5}}} + \frac{8}{3x^{\frac{1}{3}}}$

7) $f'(x) = \frac{3}{5x^{\frac{4}{5}}} + \frac{4}{x^3}$

8) $f'(x) = \frac{1}{x^{\frac{3}{4}}} - \frac{6}{x^3}$

9) $f'(x) = \frac{16}{5x^{\frac{1}{5}}} - \frac{20}{x^6}$

10) $f'(x) = \frac{2}{x^3}$

11) $f'(x) = -\frac{12}{5x^{\frac{2}{5}}} - \frac{12}{x^5}$

12) $f'(x) = \frac{2}{3x^{\frac{1}{3}}} - \frac{4}{3x^{\frac{2}{3}}} + \frac{1}{x^2}$

13) $f'(x) = -\frac{10x^{\frac{2}{3}}}{3} + \frac{4}{3x^{\frac{1}{3}}} - \frac{1}{x^2}$

14) $f'(x) = \frac{1}{5x^{\frac{4}{5}}} + \frac{15}{x^4}$

15) $f'(x) = 0$

16) $f'(x) = -\frac{1}{x^2} - \frac{6}{x^3}$

17) -3

18) 2

19) -1

20) -4

21) 0

22) -4

23) 2

24) -4