

Math 2143 - Brief Calculus with Applications

Homework #7 - 2008.02.26

Due Date - 2008.03.06

Solutions

Compute the following derivatives.

1.

$$\frac{d}{dx} \left(4x - 3x^2 + \frac{1}{2x^3} + \sqrt[4]{x} \right) = 4 - 6x - \frac{3}{2x^4} + \frac{1}{4}x^{-\frac{3}{4}}$$

2.

$$\frac{d}{dz} \frac{2z + 43z^3}{2z - 43z^3} = \frac{(2 + 129z^2)(2z - 43z^3) - (2z + 43z^3)(2 - 129z^2)}{(2z - 43z^3)^2}$$

3.

$$\begin{aligned} & \frac{d}{dy} \left(\left(2y + \frac{4y}{2y+1} \right) (7y - \sqrt{y} - 1)^2 \right) \\ &= \left(2 + \frac{4(2y+1) - 8y}{(2y+1)^2} \right) (7y - \sqrt{y} - 1)^2 + \left(2y + \frac{4y}{2y+1} \right) \cdot 2(7y - \sqrt{y} - 1) \left(7 - \frac{1}{2\sqrt{y}} \right) \end{aligned}$$

4.

$$\begin{aligned} & \frac{d}{dt} \left(\frac{3t + (4t^2 + 5)(6t^3 - 1)}{7t + 8t^3 - t^{\frac{1}{72}}} \right) \\ &= \frac{[3 + (8t)(6t^3 - 1) + (4t^2 + 5)18t^2] [7t + 8t^3 - t^{\frac{1}{72}}] - [3t + (4t^2 + 5)(6t^3 - 1)] [7 + 24t^2 - \frac{1}{72}t^{-\frac{71}{72}}]}{(7t + 8t^3 - t^{\frac{1}{72}})^2} \end{aligned}$$

5.

$$\frac{d}{ds} \left(s^3 + \frac{1+s}{1+s^{\frac{8}{21}}} \right) = 3s^2 + \frac{1 \cdot (1+s^{\frac{8}{21}}) - (1+s) \cdot \frac{8}{21}s^{-\frac{13}{21}}}{(1+s^{\frac{8}{21}})^2}$$

6.

$$\begin{aligned} & \frac{d}{dx} \left(\left(2 - \frac{1}{x} + \sqrt{x} \right) \left(\frac{x-1}{x^2+2x-2} + 3x - 1 \right) \left(7x^3 - 12x^2 + 3x - x^{-\frac{12}{11}} \right) \right) \\ &= \left(\frac{1}{x^2} + \frac{1}{2\sqrt{x}} \right) \left(\frac{x-1}{x^2+2x-2} + 3x - 1 \right) \left(7x^3 - 12x^2 + 3x - x^{-\frac{12}{11}} \right) \\ &+ \left(2 - \frac{1}{x} + \sqrt{x} \right) \left(\frac{1 \cdot (x^2+2x-2) - (x-1)(2x+2)}{(x^2+2x-2)^2} + 3 \right) \left(7x^3 - 12x^2 + 3x - x^{-\frac{12}{11}} \right) \\ &+ \left(2 - \frac{1}{x} + \sqrt{x} \right) \left(\frac{x-1}{x^2+2x-2} + 3x - 1 \right) \left(21x^2 - 24x + 3 + \frac{12}{11}x^{-\frac{23}{11}} \right) \end{aligned}$$

7.

$$\frac{d}{da} \left(\frac{a^2(b-1)c^3}{a-b^2+c^3} \right) = \frac{(2a(b-1)c^3)(a-b^2+c^3) - a^2(b-1)c^3}{(a-b^2+c^3)^2}$$

8.

$$\frac{d}{db} \left(\frac{a^2(b-1)c^3}{a-b^2+c^3} \right) = \frac{(a^2c^3)(a-b^2+c^3) - a^2(b-1)c^3 \cdot (-2b)}{(a-b^2+c^3)^2}$$

9.

$$\frac{d}{dc} \left(\frac{a^2(b-1)c^3}{a-b^2+c^3} \right) = \frac{(a^2(b-1)3c^2)(a-b^2+c^3) - a^2(b-1)c^3 \cdot 3c^2}{(a-b^2+c^3)^2}$$

10.

$$\frac{d}{dz} \left(\left(x^2 - 3x + \frac{2}{x} \right) \left(4x - 7x^3 + \frac{3}{x^\pi} + \frac{1}{x-1} \right) \left(1 - \frac{x-1}{x+1} \right) \left(\frac{2x^3 + 4x^2 - 1}{7x^2 - 2x} - 2 \right) \right) = 0$$