Finding Derivatives Expanded

Question Bank

1. For the following functions, find their derivatives by first rearranging to a suitable form then by applying the power rule.

   a) $f(x) = 3x^2(2x^3 + x^2)$

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

   c) $f(x) = x^{\frac{1}{2}}$

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

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

   f) $f(x) = 5\sqrt{x}$

   g) $f(x) = 4\sqrt{x^3}$

   h) $f(x) = \frac{8}{3}x\sqrt{x}$

   i) $f(x) = \frac{2}{\sqrt{x}}$

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

2. For each of the following functions find their derivatives.

   a) $f(x) = (4x^3 - 4x)^4$

   b) $f(x) = 2(6x^2 - 3x + 5)^3$

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

   d) $f(x) = -5\left(\frac{x^4 - 5x^3}{4}\right)^6$

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

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

3. For each of the following functions find their derivatives.

   a) $f(x) = (e^x)^3$

   b) $f(x) = (e^x + 4)^4$

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

   d) $f(x) = -\frac{2}{e^x}$

   e) $f(x) = 2(-e^x)^3$

   f) $f(x) = \sqrt{e^x}$

   g) $f(x) = 5\sqrt[3]{e^x}$

   h) $f(x) = \frac{4}{\sqrt{(e^x)^3}}$

4. For each of the following functions find their derivatives.

a) $f(x) = e^{(x^2)}$

b) $f(x) = e^{(x^3)}$

c) $f(x) = 2^{(3x^2)}$

d) $f(x) = 3^{\left(\frac{1}{x}\right)}$

e) $f(x) = e^{\left(-\frac{1}{x^2}\right)}$

f) $f(x) = e^{(x^3-3x^2)}$

g) $f(x) = 10^{\sqrt{x}}$

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

5. For each of the following functions find their derivatives.

   a)

Answers

1. a) $f'(x) = 20x^4 - 8x^3 + 18x^2$ or $2x^2(10x^2 - 4x + 9)$

   b) $f'(x) = \frac{1}{2}x^{-\frac{1}{2}}$ or $\frac{1}{2\sqrt{x}}$

   c) $f'(x) = \frac{1}{2}x^{-\frac{1}{3}}$ or $\frac{1}{2\sqrt[3]{x}}$

   d) $f'(x) = -\frac{1}{2}x^{-\frac{3}{2}}$ or $-\frac{1}{2\sqrt{x^3}}$

   e) $f'(x) = \frac{5}{2\sqrt{x}}$

   f) $f'(x) = 6\sqrt{x}$

   g) $f'(x) = 4\sqrt{x}$

   h) $f'(x) = -\frac{1}{\sqrt{x^3}}$

   i) $f'(x) = -\frac{10}{3\sqrt[3]{x^5}}$

2. a) $f'(x) = 2xe^{(x^2)}$

   b) $f'(x) = 3x^2e^{(x^3)}$

   c) $f'(x) = 3\ln(2)x2^{(3x^2)}$

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

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

   f) $f'(x) = (3x^2 - 6x)e^{(x^3-3x^2)}$

   g) $f'(x) = \frac{\ln(10)}{2\sqrt{x}}10^{\sqrt{x}}$

   h) $f'(x) = \frac{3\ln(2)\sqrt{x}}{2}2^{\sqrt{x^3}}$

3. a)