Finding Derivatives Starter

Question Bank

1. For each of the following functions, find their derivatives by first principles.

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

   b) $f(x) = 4x$

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

   d) $f(x) = x(2x + 1)$

   e) $f(x) = (x^2 + 2)(x - 4)$

   f) $f(x) = \dfrac{x + 2}{x}$

2. For each of the following functions, find their derivatives by applying this power rule.

   a) $f(x) = x^5$

   b) $f(x) = 3x^2$

   c) $f(x) = -5x^4$

   d) $f(x) = -7x^{10}$

   e) $f(x) = \dfrac{x^3}{18}$

   f) $f(x) = \dfrac{2x^6}{9}$

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

   h) $f(x) = -2x^{-4}$

   i) $f(x) = \dfrac{1}{x^3}$

   j) $f(x) = \dfrac{5}{4x^4}$

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

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

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

   c) $f(x) = e^{-x}$

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

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

   f) $f(x) = 3^{8x}$

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

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

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

   a) $f(x) = \ln(x)$

   b) $f(x) = 4\ln(x)$

   c) $f(x) = -2\ln(x)$

   d) $f(x) = 2\ln(2x)$

   e) $f(x) = \log_2(x)$

   f) $f(x) = -\log_{10}(x)$

   g) $f(x) = \log_3(2x)$

   h) $f(x) = 2\log_2(4x)$

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

   a) $f(x) = \sin(x)$

   b) $f(x) = \cos(x)$

   c) $f(x) = \tan(x)$

   d) $f(x) = \sin(3x)$

   e) $f(x) = -2\cos(4x)$

   f) $f(x) = 3\tan(x)$

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

   a) $f(x) = \sin^{-1}(x)$

   b) $f(x) = -\cos^{-1}(x)$

   c) $f(x) = \tan^{-1}(x)$

   d) $f(x) = 2\sin^{-1}(2x)$

   e) $f(x) = 15\cos^{-1}\left(\frac{x}{5}\right)$

   f) $f(x) = 3\tan^{-1}\left(\frac{x}{5}\right)$

Answers

1. a) $f'(x) = 3x^2$

   b) $f'(x) = 4$

   c) $f'(x) = 4x - 3$

   d) $f'(x) = 4x + 1$

   e) $f'(x) = 3x^2 - 8x + 2$

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

2. a) $f'(x) = 5x^4$

   b) $f'(x) = 6x$

   c) $f'(x) = -20x^3$

   d) $f'(x) = -70x^9$

   e) $f'(x) = \frac{x^2}{6}$

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

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

   h) $f'(x) = 8x^{-5}$ or $\frac{8}{x^5}$

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

   j) $f'(x) = \frac{-5}{x^5}$

   k) $f'(x) = 30x^4 + 12x^3$ or $6x^3(5x+2)$

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

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

   c) $f'(x) = -e^{-x}$

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

   e) $f'(x) = \ln(2)2^x$

   f) $f'(x) = 8\ln(3)3^{8x}$

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

   h) $f'(x) = \frac{\ln(5)5^{-\frac{x}{2}}}{2}$

4. a) $f'(x) = \frac{1}{x}$

   b) $f'(x) = \frac{4}{x}$

   c) $f'(x) = -\frac{2}{x}$

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

   e) $f'(x) = \frac{1}{\ln(2)x}$

   f) $f'(x) = -\frac{1}{\ln(10)x}$

   g) $f'(x) = \frac{2}{2\ln(3)x}$

   h) $f'(x) = \frac{8}{4\ln(2)x}$

5. a) $f'(x) = \cos(x)$

   b) $f'(x) = -\sin(x)$

   c) $f'(x) = \sec^2(x)$

   d) $f'(x) = 3\cos(3x)$

   e) $f'(x) = 8\sin(4x)$

   f) $f'(x) = 3\sec^2(x)$

6. a) $f'(x) = \dfrac{1}{\sqrt{1-x^2}}$

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

   c) $f'(x) = \dfrac{1}{1+x^2}$

   d) $f'(x) = \dfrac{3}{\sqrt{1-4x^2}}$

   e) $f'(x) = \dfrac{3}{\sqrt{1-\frac{x^2}{25}}}$

   f) $f'(x) = \dfrac{15}{25+x^2}$