

IB Math 12 - Differentiation Practice Questions

1. Find the derivative of each of the following:

- a) $(3x - 7)^{12}$ b) $\sin(5x + 2)$ c) $\ln(2x - 1)$ d) e^{2-3x}
e) $\sqrt{5x - 3}$ f) $(6x + 5)^{5/3}$ g) $\frac{1}{(3-x)^4}$ h) $\cos(1 - 4x)$

2. Find the derivative of each of the following:

- a) $\ln(\sin x)$ b) $\sin(\ln x)$ c) $e^{-\cos x}$ d) $\cos(e^{-x})$
e) $(\sin x + \cos x)^3$ f) $\sqrt{1+x^2}$ g) $\frac{1}{\cos x}$ h) $\frac{1}{x^2+2x+1}$

3. Find the derivative of each of the following:

- a) $\ln(\sin^2 x)$ b) $\sin^2(\ln x)$ c) $\sqrt{\cos(3x - 1)}$ d) $[1 + \cos(x^2 - 1)]^{3/2}$

4. Find the derivative of each of the following:

- a) $x \tan x$ b) $x^2 e^{-x}$ c) $5e^{-2x} \sin 3x$ d) $3x^{1/2} \cos 2x$
e) $2x^6(1+x)^5$ f) $x^{-2}(1+x^2)^{1/2}$ g) $x e^x \sin x$ h) $7x^{3/2} e^{-4x} \cos 2x$

5. Find the derivative of each of the following:

- a) $\frac{\sin x}{x}$ b) $\frac{\cos x}{x^2}$ c) $\frac{2x+1}{3x-4}$ d) $\frac{3x-4}{2x+1}$
e) $\frac{e^{2x}}{x}$ f) $\frac{e^{-3x}}{x^2+1}$ g) $\frac{x^2-3}{2x+1}$ h) $\frac{2x+1}{x^2-3}$

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Answers

1. a) $36(3x - 7)^{11}$ b) $5 \cos(5x + 2)$ c) $\frac{2}{2x - 1}$ d) $-3e^{2-3x}$
 e) $\frac{5}{2\sqrt{5x-3}}$ f) $10(6x+5)^{2/3}$ g) $\frac{4}{(3-x)^5}$ h) $4 \sin(1 - 4x)$

2. a) $\frac{\cos x}{\sin x} = \cot x$ b) $\frac{\cos(\ln x)}{x}$ c) $\sin x e^{-\cos x}$
 d) $e^{-x} \sin(e^{-x})$ e) $3(\cos x - \sin x)(\sin x + \cos x)^2$ f) $\frac{x}{\sqrt{1+x^2}}$
 g) $\frac{\sin x}{\cos^2 x} = \tan x \sec x$ h) $\frac{-2(x+1)}{(x^2+2x+1)^4} = \frac{-2}{(x+1)^3}$

3. a) $\frac{2 \cos x}{\sin x} = 2 \cot x$ b) $\frac{2 \sin(\ln x) \cos(\ln x)}{x}$
 c) $\frac{-3 \sin(3x-1)}{2\sqrt{\cos(3x-1)}}$ d) $-3x \sin(x^2-1) [1 + \cos(x^2-1)]^{1/2}$

4. a) $x \sec^2 x + \tan x$ b) $x(2-x)e^{-x}$
 c) $5e^{-2x}(3 \cos 3x - 2 \sin 3x)$ d) $\frac{3}{2}x^{-1/2}(\cos 2x - 4x \sin 2x)$
 e) $2x^5(1+x)^4(6+11x)$ f) $-x^{-3}((1+x^2)^{-1/2}(2+x^2))$
 g) $e^x[(1+x)\sin x + \cos x]$ h) $\frac{7}{2}x^{1/2}e^{-4x}(3 \cos 2x - 8x \cos 2x - 4x \sin x)$

5. a) $\frac{x \cos x - \sin x}{x^2}$ b) $\frac{-(x \sin x + 2 \cos x)}{x^3}$ c) $\frac{-11}{(3x-4)^2}$ d) $\frac{11}{(2x+1)^2}$
 e) $\frac{(2x-1)e^{2x}}{x^2}$ f) $\frac{-(3x^2+2x+3)e^{-3x}}{(x^2+1)^2}$ g) $\frac{2(x^2+x+3)}{(2x+1)^2}$ h) $\frac{-2(x^2+x+3)}{(x^2-3)^2}$