Mathematics Tutorial Series
Differential Calculus #11

Examples

Find the derivative of each.

1. $y = \dfrac{x^2+1}{x-7}$

2. $y = \dfrac{\sin x}{x^2}$

3. $y = \cos x \sin^2 x$

4. $y = \sqrt{\sin x + \tan x}$

5. $y = \cos(5x^2 + 7)$

6. $y = 2\sin x + \tan^2 x$

7. $y = x \sin x$

8. $y = \cos(x\sqrt{x^2 + 3})$

$y = \dfrac{x^2 + 1}{x - 7}$

➜ $y' = \dfrac{(x^2+1)'(x-7) - (x^2+1)(x-7)'}{(x-7)^2}$

$\quad = \dfrac{2x(x-7) - (x^2+1)}{(x-7)^2}$

$y = \dfrac{\sin x}{x^2}$

➜ $y' = \dfrac{\cos x \, x^2 - \sin x \,(2x)}{x^4}$

$y = \cos x \sin^2 x$

➜ $y' = (\cos x)' \sin^2 x + \cos x \,(\sin^2 x)'$

$\quad = (-\sin x)\sin^2 x + \cos x\,(2\sin x \cos x)$

$\quad = -\sin^3 x + 2\sin x \cos^2 x$

$y = \sqrt{\sin x + \tan x}$

$\rightarrow y' = \dfrac{1}{2\sqrt{\sin x + \tan x}}(\sin x + \tan x)'$

$\quad\quad = \dfrac{\cos x + \sec^2 x}{2\sqrt{\sin x + \tan x}}$

$y = \cos(5x^2 + 7)$

$\rightarrow y' = -\sin(5x^2 + 7)\,(5x^2 + 7)'$

$\quad\quad = -\sin(5x^2 + 7)(10x)$

$y = 2\sin x + \tan^2 x$

$\rightarrow y' = 2\cos x + 2\tan x \sec^2 x$

$y = x\sin x$

$\rightarrow y' = \sin x + x\cos x$

$y = \cos(x\sqrt{x^2 + 3})$

$\rightarrow y' = -\sin(x\sqrt{x^2 + 3})\,(x\sqrt{x^2 + 3})'$

$= -\sin(x\sqrt{x^2 + 3})\,(\sqrt{x^2 + 3} + x\,\dfrac{1}{2\sqrt{x^2+3}}(x^2 + 3)')$

$= -\sin(x\sqrt{x^2 + 3})\,(\sqrt{x^2 + 3} + x\,\dfrac{2x}{2\sqrt{x^2+3}})$

$= -\sin(x\sqrt{x^2 + 3})\,\dfrac{2x^2 + 3}{\sqrt{x^2 + 3}}$