

Differentiation examples: block 2

Question	Rules	Hints	Answer
$\sin(3x)$			$3 \cos(3x)$
$\cos(9x)$			$-9 \sin(9x)$
$\cos(x^2)$			$-2x \sin(x^2)$
$\exp(8x^3)$			$24x^2 \exp(8x^3)$
$(\sin(x))^3$	chain	$g(x) = x^3, h(x) = \sin(x)$	$3 \cos(x)(\sin(x))^2$
$(\exp(x))^2$	chain	$g(x) = x^2, h(x) = \exp(x)$	$2 \exp(x)$
$\sin(9x + 4)$			$9 \cos(9x + 4)$
$(x^2 + 3)^4$			$8x(x^2 + 3)^3$
$(9x + 5)^3$			$27(9x + 5)^2$
$\cos(2x) + 3$			$-2 \sin(2x)$
$\cos(\sin(3x))$			$-3 \cos(3x) \sin(\sin(3x))$
e^{x^2}			$2xe^{x^2}$
$e^{x^2/2}$			$xe^{x^2/2}$
$x + \sqrt{x}$			$1 + \frac{x^{-1/2}}{2}$
$x \sin(x)$	product	$g(x) = x, h(x) = \sin(x)$	$\sin(x) + x \cos(x)$
$x^2 \sin(x)$	product	$g(x) = x^2, h(x) = \sin(x)$	$2x \sin(x) + x^2 \cos(x)$
$\sin(x) \cos(x)$	product	$g(x) = \sin(x), h(x) = \cos(x)$	$\cos^2(x) - \sin^2(x)$
$x \exp(3x)$	product	$g(x) = x, h(x) = \exp(3x)$	$\exp(3x) + 3x \exp(3x)$
$\exp(x) \sin(x)$			$\exp(x) \sin(x) + \exp(x) \cos(x)$
$\exp(\sin(x))$			$\cos(x) \exp(\sin(x))$
$x^3 e^{2x}$			$3x^2 e^{2x} + 2x^3 e^{2x}$
$\cos(73x) - 9$			$-73 \cos(73x)$
$2/x$			$-2x^{-2}$
$3x \sin(x)$			$3x \cos(x) + 3 \sin(x)$
$\exp(9x) \sin(x)$			$\exp(9x) \cos(x) + 9 \exp(9x) \sin(x)$
$\exp(8x) \cos(2x)$			$8 \exp(8x) \cos(2x) - 2 \exp(8x) \sin(2x)$
$\cos(3x) \cos(4x)$			$-3 \sin(3x) \cos(4x) - 4 \cos(3x) \sin(4x)$
$x^2(2x + 3)$			$2x(2x + 3) + 2x^2$
$x^7(x + 1)^6$			$7x^6(x + 1)^6 + 6x^7(x + 1)^5$
$3x^2 \cos(x)$			$6x \cos(x) - 3x^2 \sin(x)$
$\cos(x^2) + 9x$			$9 - 2x \sin(x^2)$
$\exp(x^2) + 2x^3$			$2x \exp(x^2) + 6x^2$

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$\exp(x^2) \sin(x)$	ch.+prod		$2x \sin(x) \exp(x^2) + \cos(x) \exp(x^2)$
$\sin(x^7) \cos(x)$	ch.+prod		$7x^6 \cos(x^7) \cos(x) - \sin(x^7) \sin(x)$
$(x+1)^2(x-1)^2$			$2(x+1)(x-1)^2 + 2(x-1)(x+1)^2$
$(2x+3)^2(5x-1)^2$			$4(2x+3)(5x-1)^2 + 10(5x-1)(2x+3)^2$
$3/x^2$			$-6x^{-3}$
$\cos(5x)$			$-5 \sin(5x)$
$\cos(3x^2)$			$-6x \sin(3x^2)$
$1/(x+5)$	chain	$g(x) = 1/x, h(x) = x+5$	$-(x+5)^{-2}$
$1/(x^2+5)$	chain	$g(x) = 1/x, h(x) = x^2+5$	$-2x(x^2+5)^{-2}$
$5/(x+5)^3$	chain	$g(x) = 5x^{-3}, h(x) = x+5$	$-15(x+5)^{-4}$
$8/(x^3+4)^5$	chain	$g(x) = 8x^{-5}, h(x) = x^3+4$	$-120x^2(x^3+4)^{-6}$
$1/\sin(x)$	chain	$g(x) = x^{-1}, h(x) = \sin(x)$	$-\frac{\cos(x)}{\sin^2(x)}$
$1/\exp(x)$	chain	$g(x) = x^{-1}, h(x) = \exp(x)$	$-\frac{1}{\exp(x)} = -\exp(-x)$
	...or	$1/\exp(x) = \exp(-x)$	$-\exp(-x)$
$3/\sin(x)$			$-\frac{3 \cos(x)}{\sin^2(x)}$
$2/(x^3+1)$			$-6x^2(x^3+1)^{-2}$
$2/(x^3+2x)$			$-2(3x^2+2)(x^3+2x)^{-2}$
$2/(x^3+2x)^7$			$-14(3x^2+2)(x^3+2x)^{-8}$
x^3+9x^7			$3x^2+63x^6$
$\sin(3x+9)$			$3 \cos(3x+9)$
$\sin(3/x)$			$-\frac{3}{x^2} \cos\left(\frac{3}{x}\right)$
$\sin(\sqrt{x})$			$\frac{1}{2}x^{-1/2} \cos(\sqrt{x})$
$x^3 \exp(7x)$			$3x^2 \exp(7x) + 7x^3 \exp(7x)$
13			0
$\frac{2}{x^8+x^7}$			$-\frac{16x^7+14x^6}{(x^8+x^7)^2}$
$\sin(\exp(5x))$			$5 \exp(5x) \cos(\exp(5x))$
$\cos(e^{2x})$			$-2 \exp(2x) \sin(e^{2x})$
$x^3(x-2)^2$			$3x^2(x-2)^2 + 2(x-2)x^3$
$\sin(3x) + \cos^2(2x)$			$3 \cos(3x) + 4 \sin(2x) \cos(2x)$
$\sin(x^{18}+5)$			$18x^{17} \cos(x^{18}+5)$
$\sqrt{\cos(x)}$			$-\frac{\sin(x)}{2} (\cos(x))^{-1/2}$
$(3x)^{7/3}$			$7x^{4/3}$