

Worksheet: Differentiating Basic Functions

This worksheet will help you practise differentiating basic functions using a set of rules.

Model answers to this sheet



Differentiating Basic Functions study guide



You will need to use these rules to help you answer the questions on this sheet.

rule	function	derivative
1	k	0
2	ax	a
3	ax^n	anx^{n-1}
4	$a\sin kx$	$ak\cos kx$
5	$a\cos kx$	$-ak\sin kx$
6	ae^{kx}	ake^{kx}
7	$a\ln(kx)$	a/x

1. Look carefully at each of the power functions below and choose the appropriate rule from the table which will enable you to find the derivative. When you have chosen a rule, identify the value(s) of the constant(s) you need (a , k , n) and differentiate the function with respect to x .

- (a) $y = 7$ (b) $y = \frac{1}{7}$ (c) $y = -7x$ (d) $y = \frac{1}{7}x$ (e) $y = \frac{x}{7}$
- (f) $y = \frac{3x}{7}$ (g) $y = -7x^2$ (h) $y = 7x^3$ (i) $y = -7x^{-2}$ (j) $y = -\frac{7}{x^2}$
- (k) $y = -\frac{7}{3x^2}$ (l) $y = \frac{1}{7x^2}$ (m) $y = (7x^3)^2$ (n) $y = (-7x^3)^2$ (o) $y = \sqrt[2]{x}$
- (p) $y = 7\sqrt[2]{x}$ (q) $y = \frac{\sqrt[2]{x}}{7}$ (r) $y = \frac{7}{\sqrt[2]{x}}$ (s) $y = -\frac{7}{\sqrt[2]{x}}$ (t) $y = -\frac{1}{7\sqrt[2]{x}}$

2. Look carefully at each of the other types of basic functions below and choose the appropriate rule from the table which will enable you to find the derivative. When you have chosen a rule, identify the value(s) of the constant(s) you need (a , k) and differentiate the function with respect to x .

(a) $y = 7 \sin x$	(b) $y = \cos(7x)$	(c) $y = 3 \sin(7x)$	(d) $y = \sin\left(\frac{x}{7}\right)$
(e) $y = \frac{\sin x}{7}$	(f) $y = 7 \cos(-x)$	(g) $y = -\cos\left(\frac{x}{7}\right)$	(h) $y = \frac{-\cos(-3x)}{7}$
(i) $y = \cos\left(\frac{3x}{7}\right)$	(j) $y = -\frac{\sin(x/7)}{3}$	(k) $y = \frac{3 \cos x}{7}$	(l) $y = 7e^x$
(m) $y = e^{-7x}$	(n) $y = \frac{e^{-x}}{7}$	(o) $y = e$	(p) $y = \frac{1}{7e^x}$
(q) $y = \frac{7}{e^{3x}}$	(r) $y = (e^x)^2$	(s) $y = \left(\frac{1}{e^x}\right)^2$	(t) $y = 7 \ln x$
(u) $y = \ln(7x)$	(v) $y = \ln 7$	(w) $y = \frac{\ln x}{7}$	(x) $y = \ln\left(\frac{x}{7}\right)$

3. You can differentiate more complicated functions which are made by addition and subtraction of basic functions by finding the derivative of each term in the function one at a time and then summing the answers. This is term-by-term differentiation. Use term-by-term differentiation to find the derivatives of the following functions.

(a) $y = 7x^2 + x - \frac{1}{3}$	(b) $y = x^3 - 3x^2 - 5x + 1$	(c) $y = \sin x + \cos x$
(d) $y = 7 \cos x - \sin(7x)$	(e) $y = e^x - e^{-x} + \frac{1}{2}$	(f) $y = 7 - \ln(3)$
(g) $y = \frac{x^2 + 2x + 2}{7}$	(h) $y = (x+1)^2$	(i) $y = (e^x - e^{-x})^2 + 1$
(j) $y = \cos(2x) - \sin(2x)$	(k) $y = \frac{e^{2x} + e^{-2x}}{3}$	(l) $y = \frac{x^2 + 2x - 1}{x^2}$



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