


Worksheet: Integrating Basic Functions

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

Model answers to this sheet



Integrating Basic Functions study guide



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

| rule | function | integral |
|------|--|--|
| 1 | $y = a$ | $\int a dx = ax + c$ |
| 2 | $y = ax^n$ (if $n \neq -1$) | $\int ax^n dx = \frac{ax^{n+1}}{n+1} + c$ |
| 3 | $y = \frac{a}{x} = ax^{-1}$ (if $n = -1$) | $\int \frac{a}{x} dx = a \ln x + c$ |
| 4 | $y = a \sin kx$ | $\int a \sin kx dx = -\frac{a}{k} \cos kx + c$ |
| 5 | $y = a \cos kx$ | $\int a \cos kx dx = \frac{a}{k} \sin kx + c$ |
| 6 | $y = ae^{kx}$ | $\int ae^{kx} dx = \frac{a}{k} e^{kx} + c$ |

1. Look carefully at each of the power functions below and choose the appropriate rule from the table which will enable you to integrate it. When you have chosen a rule, identify the value(s) of the constant(s) you need (a , k , n) and integrate 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) $y = \frac{7}{x}$ (m) $y = (7x^3)^2$ (n) $y = (-7x^3)^2$ (o) $y = \sqrt{x}$
- (p) $y = 7\sqrt{x}$ (q) $y = \frac{1}{7x}$ (r) $y = \frac{1}{x^7}$ (s) $y = -\frac{7}{\sqrt{x}}$ (t) $y = -\frac{1}{7\sqrt[3]{x}}$

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 integrate it. When you have chosen a rule, identify the value(s) of the constant(s) you need (a , k) and integrate 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) $y = \ln 7$

3. You can integrate more complicated functions which are made by addition and subtraction of basic functions by finding the integral of each term in the function one at a time and then summing the answers. This is term-by-term integration. Use term-by-term integration to integrate 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) $y = (e^x - e^{-x})^2 + 2$
- (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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