

## Worksheet: Differentiating $y = ax^n$

This worksheet has questions about the differentiation using the power rule which allows you to differentiate equations of the form  $y = ax^n$ . Before attempting the questions below you should be familiar with the concepts in the study guide:

[Differentiating using the Power Rule.](#)

Model answers  
to this sheet



Differentiating using  
the Power Rule  
study guide



- Find  $\frac{dy}{dx}$  when  $y$  is defined by the following equations:
  - $y = 3x^3$
  - $y = x^3$
  - $y = -2x^2$
  - $y = 1.1x^9$
  - $y = 7$
  - $y = -23.004$
  - $y = 0$
  - $y = \pi$
  - $y = 2x$
  - $y = 4 - x$
  - $y = \frac{2}{9}x^3$
  - $y = -3 + 2x - 4x^3$
- Find the gradient at the point where  $x = 1$  for all of the curves defined in question 1.
- Find  $\frac{dy}{dx}$  when  $y$  is defined by the following equations:
  - $y = \frac{x^3}{2}$
  - $y = \frac{4-x}{3}$
  - $y = 2x^{-1}$
  - $y = \frac{2}{x}$
  - $y = \frac{5}{x^3}$
  - $y = \frac{1}{5}x^3$
  - $y = \frac{x^3}{5}$
  - $y = \frac{1}{5x^3}$
  - $y = x^{\frac{1}{2}}$
  - $y = \sqrt{x}$
  - $y = \frac{\sqrt[3]{x}}{7}$
  - $y = \frac{4 - \sqrt[5]{x}}{3}$
  - $y = \frac{2}{\sqrt{x}}$
  - $y = \frac{7}{\sqrt[3]{x}}$
  - $y = \frac{x^3 - 3}{2} + \frac{3 - x^3}{2}$

4. Differentiate the following:

a) Find  $\frac{dE}{dv}$  where  $E = \frac{1}{2}mv^2$  and  $m$  is a constant

b) Find  $\frac{dE}{dP}$  where  $E = \frac{Q}{P}$  and  $Q$  is a constant.

c) Find  $\frac{dE}{dQ}$  where  $E = \frac{Q}{P}$  and  $P$  is a constant.

d) Find  $\frac{dE}{dm}$  where  $E = mc^2$  and  $c$  is a constant.

e) Find  $\frac{ds}{dt}$  where  $s = ut + \frac{1}{2}at^2$  and  $u$  and  $a$  are constants.

f) Find  $\frac{dv^2}{ds}$  where  $v^2 = u^2 + 2as$  and  $u$  and  $a$  are constants.

g) Find  $\frac{dy}{dx}$  where  $y = mx + c$  and  $m$  and  $c$  are constants



This worksheet is one of a series on mathematics produced by the Learning Enhancement Team.

Scan the QR-code with a smartphone app for [more resources](#).



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