# Differentiation (Part 1)

250a

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Name:

Differentiate:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| a) $y = x^3$ | $\frac{dy}{dx} = 3x^2$ | e) $y = 6x^2$ | $\frac{dy}{dx} = 12x$ | i) $y = 2x^{-3}$ | $\frac{dy}{dx} = -6x^{-4}$ |
| b) $y = x^6$ | $\frac{dy}{dx} = 6x^5$ | f) $y = 14x^3$ | $\frac{dy}{dx} = 42x^2$ | j) $y = 4x^{-7}$ | $\frac{dy}{dx} = -28x^{-8}$ |
| c) $y = x^{10}$ | $\frac{dy}{dx} = 10x^9$ | g) $y = 2x^3$ | $\frac{dy}{dx} = 6x^2$ | k) $y = -7x^3$ | $\frac{dy}{dx} = -21x^2$ |
| d) $y = x^8$ | $\frac{dy}{dx} = 8x^7$ | h) $y = -2x^6$ | $\frac{dy}{dx} = -12x^5$ | l) $y = -4x^{-2}$ | $\frac{dy}{dx} = 8x^{-3}$ |

Differentiate:

a) $y = x^5 + 3x^2 + 6$ $\quad \frac{dy}{dx} = 5x^4 + 6x$

b) $y = x^6 + 11x^2 + 2x$ $\quad \frac{dy}{dx} = 6x^5 + 22x + 2$

c) $y = 3x^4 - 2x^2 + 5x$ $\quad \frac{dy}{dx} = 12x^3 - 4x + 5$

d) $y = 5x^6 - 3x^4 - 3x^2$ $\quad \frac{dy}{dx} = 30x^5 - 12x^3 - 6x$

e) $y = x^{-3} + 7x^{-2} - 3x$ $\quad \frac{dy}{dx} = -3x^{-4} - 14x^{-3} - 3$

f) $y = x^4 - 2x^{-2} + 6$ $\quad \frac{dy}{dx} = 4x^3 + 4x^{-3}$

g) $y = \frac{1}{2}x^3 + 4x^3 + 8$ $\quad \frac{dy}{dx} = \frac{3}{2}x^2 + 12x^2$

h) $y = \frac{3}{2}x^8 + 4x^{-1} + 7x$ $\quad \frac{dy}{dx} = 12x^7 - 4x^{-2} + 7$

Find the gradient of the curve:

a) $y = x^2 + 3x + 7$ when $x = 3$ $\quad$ **9**

b) $y = x^2 - 4x + 2$ when $x = 2$ $\quad$ **0**

c) $y = 3x^2 + 6x + 4$ when $x = 5$ $\quad$ **36**

d) $y = 2x^3 + 5x^2 - 2x$ when $x = 1$ $\quad$ **14**

e) $y = 7x^3 - 4x$ when $x = -1$ $\quad$ **17**

f) $y = 5x^2 - 2x - 7$ when $x = -2$ $\quad$ **−22**

**Exam question:**

$y = x^3 - 7x + 3$

Find the gradient of the curve at the point where the curve intersects the y-axis. $\quad$ **−7**

# Differentiation (Part 1)

250b

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Find the gradient of the curve:

a) $y = x^2 + 4x + 1$ at $(1, 6)$

**6**

b) $y = x^2 - 2x$ at $(3, 3)$

**4**

c) $y = 3x^2 + 2x + 4$ at $(2, 20)$

**14**

d) $y = x^3 + x^2 + 3x$ at $(2, 18)$

**19**

e) $y = 3x^3 + x^2 - 5x + 1$ at $(1, -1)$

**6**

f) $y = 36x^{-1} + 4x - 4$ at $(3, 20)$

**0**

Find the co-ordinate(s) of the point(s) on the curve:

a) $y = x^2$, when gradient $= 10$

**$(5, 25)$**

b) $y = x^2 + 4x - 5$, when gradient $= 14$

**$(5, 40)$**

c) $y = x^2 - 2x + 1$, when gradient $= 10$

**$(6, 25)$**

d) $y = 3x^2 + 8x + 1$, when gradient $= 32$

**$(4, 81)$**

e) $y = 4x^2 - 5x - 1$, when gradient $= 43$

**$(6, 113)$**

f) $y = 2x^3 - 4x$, when gradient $= 20$

**$(-2, -8)$ and $(2, 8)$**

g) $y = 5x - x^2$, when gradient $= 11$

**$(-3, -24)$**

h) $y = 4 - 2x - 3x^2$, when gradient $= -8$

**$(1, -1)$**

**Exam question:**

$y = 3x^2 - 4x + 5$

Find the co-ordinates of the point on the curve where the gradient of the curve is $-2$.

**$\left(\frac{1}{3}, 4\right)$**