

REFRESHING YOUR BASIC KNOWLEDGE

<p>1a If $y = 12x^2$ $\frac{dy}{dx} = 24x$</p>	<p>1b If $\frac{dy}{dx} = 12x^2$ $y = \frac{12x^3}{3} + c = 4x^3 + c$</p>
<p>2a If $y = x^5$ $\frac{dy}{dx} = 5x^4$</p>	<p>2b If $\frac{dy}{dx} = x^5$ $y = \frac{x^6}{6} + c$</p>
<p>3a If $y = 3x^4$ $\frac{dy}{dx} = 12x^3$</p>	<p>3b If $\frac{dy}{dx} = 3x^4$ $y = \frac{3x^5}{5} + c$</p>
<p>4a If $y = \frac{x^3}{3}$ $\frac{dy}{dx} = \frac{3x^2}{3} = x^2$</p>	<p>4b If $\frac{dy}{dx} = \frac{x^3}{3}$ $y = \frac{x^4}{12} + c$</p>
<p>5a If $y = (x+7)(x-9)$ $= x^2 + -2x - 63$ $\frac{dy}{dx} = 2x - 2$</p>	<p>5b If $\frac{dy}{dx} = (x+7)(x-9)$ $= x^2 - 2x - 63$ $y = \frac{x^3}{3} - x^2 - 63x + c$</p>
<p>6a Find the gradient of $y = x^2 - 6x$ at $x = 3$ $y' = 2x - 6$ Sub $x = 3$ $y' = 6 - 6 = 0$</p>	<p>6b If $\frac{dy}{dx} = x^2 - 6x$ find the equation for y given that the curve goes through $(3, 10)$ $y = \frac{x^3}{3} - 3x^2 + c$ Sub $(3, 10)$ $10 = 9 - 27 + c \therefore c = 28$ $y = \frac{x^3}{3} - 3x^2 + 28$</p>
<p>7a Find the gradient of $y = \frac{x^3}{3} + x^2$ at the point $(3, 18)$ $y' = x^2 + 2x$ Sub $x = 3$ $y' = 9 + 6 = 15$</p> <p style="margin-left: 200px;"> { Note the 18 is irrelevant </p>	<p>7b Find the equation of the tangent to the curve $y = \frac{x^3}{3} + x^2$ at $(3, 18)$ $y' = x^2 + 2x \Big _3 = 15$ TAN's line $y = mx + c$ Sub $18 = 15 \cdot 3 + c$ $-27 = c$ TAN's $y = 15x - 27$</p>
<p>8a Find the gradient of the tangent to $y = x^2 - 4x$ at the point $(1, -3)$ $y' = 2x - 4$ Sub $x = 1$ $y' = 2 - 4 = -2$</p>	<p>8b Find the equation of the tangent to $y = x^2 - 4x$ at the point $(1, -3)$ $y' = 2x - 4 = -2$ TAN's line $y = mx + c$ Sub $-3 = -2 \cdot 1 + c$ $-1 = c$ TAN's $y = -2x - 1$</p>


9 Find the x value of the point on the curve $y = x^2 - 6x + 8$ where the gradient is equal to 4

$$\begin{aligned} \text{grad } y' &= 2x - 6 = 4 \\ 2x &= 10 \\ x &= 5 \end{aligned}$$

10 Find the x value of the point on the curve $y = x^2 - 6x + 8$ where the gradient is equal to 0.

Also do a sketch to verify whether this is a maximum point or a minimum point.

$$\begin{aligned} y' &= 2x - 6 = 0 \\ 2x &= 6 \\ x &= 3 \end{aligned}$$

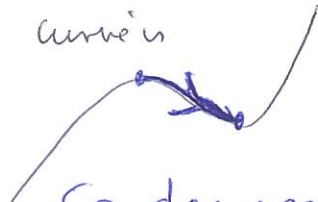
Curve is 
So Min point

11 Find the x values of the points on the curve $y = 2x^3 - 6x^2 - 12$ where the gradient is equal to 0.

Also do a sketch to verify which value gives a maximum point and which value of x gives a minimum point.

Between what two x values is this function decreasing?

$$\begin{aligned} y' &= 6x^2 - 12x = 0 \text{ at max/min} \\ 6x(x - 2) &= 0 \\ x &= 0, 2 \end{aligned}$$

Curve is 

So Max is at $x = 0$

Min is at $x = 2$

So decreasing if $0 < x < 2$

12 The height of a ball kicked vertically up is $h = 40t - 5t^2$.

Find the greatest height the ball will reach.

$$\begin{aligned} \text{Vel } v &= \frac{dh}{dt} = 40 - 10t = 0 \text{ at max ht} \\ &= 10t \\ 4 &= t \end{aligned}$$

Sub $t = 4$ in $h = 40t - 5t^2$

$$\text{Max } h = 40 \times 4 - 5 \times 16 = 80 \text{ m}$$