L2 Calculus Revision #5

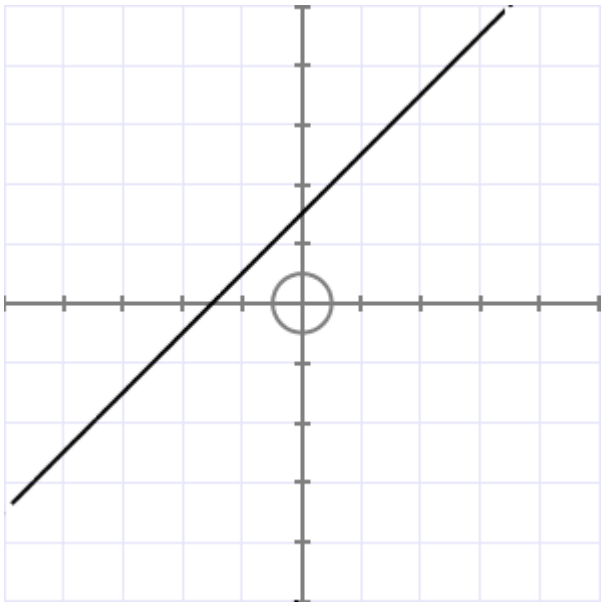
1. Find the gradient of the graph of $y = 5 - 3x^2 + 4x$ at (4, –27)

2. A curve has $f(6) = 5$ and $f'(x) = x^2 - 3x + 2$. Find the equation of the curve

3. What is the value of the function given by $f(x) = 5x - 2x^2$ when it has a gradient of –2?

4. To the right is a **gradient** function.

   Sketch the matching function.



5. If the velocity of a car is given by $v = 10 + 8t - 0.3t^2$, how far will the car go in the first 5 seconds? (t is in seconds, and distance is metres)

6. Find the equation of the tangent to $y = x^2 - 5x + 3$ at (3, –3).

Answers: L2 Calculus Revision #5

1. $y = 5 - 3x^2 + 4x$ so $\frac{dy}{dx} = -6x + 4$ at $x = 4$ $\frac{dy}{dx} = -6\times4 + 4 = -20$

   Gradient at (4, –27) = **–20**

2. $f'(x) = x^2 - 3x + 2$ so $f(x) = \frac{1}{3}x^3 - 1.5\,x^2 + 2x + C$

   told $f(6) = 5$ so $5 = \frac{1}{3} \times 6^3 - 1.5 \times 6^2 + 2 \times 6 + C$ So C = –25

   Equation is $\boldsymbol{f(x) = \frac{1}{3}x^3 - 1.5\,x^2 + 2x - 25}$

3 $f(x) = 5x - 2x^2$ so $f'(x) = 5 - 4x$ Want where gradient = –2

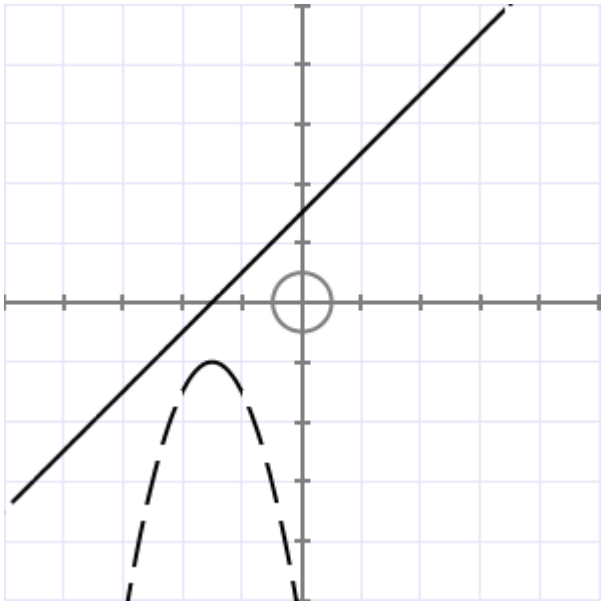
   so $-2 = 5 - 4x$ $x = 1.75$ Put this back into original equation

   $f(x) = 5 \times 1.75 - 2 \times 1.75^2 = 2.625$ **The function's value is 2.625**

4. **A negative parabola**
   with the **turning point at –1.5**.

   The width of the parabola is not important, so it can be fatter or skinnier.

   The height of the parabola does not matter. It can cross the x-axis rather than staying below it (as shown here).



5. $v = 10 + 8t - 0.3t^2$

   so distance = $10t + 4t^2 - 0.1t^3 + C$ Set C = 0, as it starts from 0 metres at $t = 0$

   distance at 5 seconds = $10 \times 5 + 4 \times (5)^2 - 0.1 \times (5)^3$ = **137.5 metres**

6 $y = x^2 - 5x + 3$ so $\frac{dy}{dx} = 2x - 5$ At $x = 3$

   so $\frac{dy}{dx} = 2 \times 3 - 5 = 1$ At point (3, –3)

   using $y - y_1 = m(x - x_1)$ with gradient 1, through (3, –3) $y - -3 = 1(x - 3)$

   Equation of tangent is: $y = x - 6$

Questions 5 and 6 are Merit