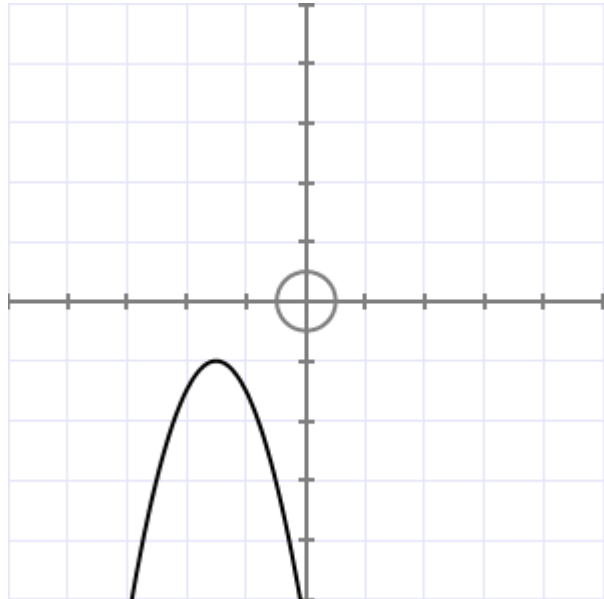


L2 Calculus Revision #1

1. Find the gradient of the curve $y = 3x^2 - 8x + 5$ at $(2, 1)$.

2. Sketch the derivative function for the parabola shown to the right.



3. The gradient function for a curve is $f'(x) = 2.5x - 12x^2$.

The curve passes through the point $(4, 5)$

Find the equation of the curve.

4. For the graph of the equation $y = \frac{x^2 + 5x - 4}{3}$ find the coordinates of the point(s) on the graph where the gradient is 4.

5. The height of a rocket is given by $s = 40t - 4t^2$

where s is the height (metres) and t is the time (seconds) after launch.

Calculate the maximum height of the rocket.

6. A grain silo starts filling at a rate of 2.4 m^3 per minute, which decreases according to the equation: $\text{rate} = 2.4 - 0.2t$.

How much grain goes into the silo in the first 2 minutes?

Answers: L2 Calculus Revision #1

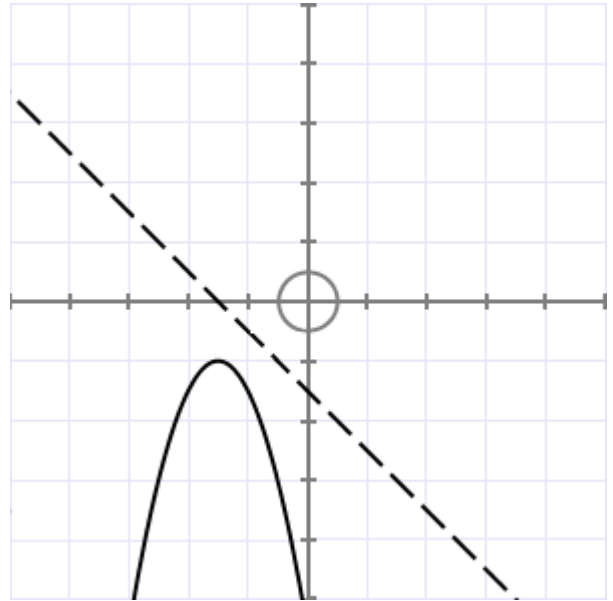
1. $y = 3x^2 - 8x + 5$ so $\frac{dy}{dx} = 6x - 8$

At $x = 2$, $\frac{dy}{dx} = 6 \times 2 - 8 = 4$

Gradient = 4

2. **Drawn**

- It must be
- a straight line
 - a negative slope
 - with the shown x -intercept



3. $f'(x) = 2.5x - 12x^2$ so $f(x) = 1.25x^2 - 4x^3 + C$

Passes through (4, 5) so $5 = 1.25 \times 4^2 - 4 \times 4^3 + C$. Solving gives $C = 241$

Equation is $y = 1.25x^2 - 4x^3 + 241$

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

We want when $4 = \frac{2}{3}x + \frac{5}{3}$ Multiplying through by 3 gives $12 = 2x + 5$

Solving, $x = 3.5$ $y = \frac{3.5^2 + 5 \times 3.5 - 4}{3} = 8.58$

Coordinates are (3.5, 8.58)

5. $s = 40t - 4t^2$ so velocity, $v = \frac{ds}{dt} = 40 - 8t$

Maximum when $v = 0$ at top of parabola. $0 = 40 - 8t$, so when $t = 5$

Putting $t = 5$ into the original equation, gives $40 \times 5 - 4 \times 5^2$

Maximum height = 100 metres

6. rate = $2.4 - 0.2t$ so volume = $2.4t - 0.1t^2$ (anti-diff rate to find amount)

Vol at $t = 0$ is $2.4 \times 0 - 0.1 \times 0^2$ Vol at $t = 2$ is $2.4 \times 2 - 0.1 \times 2^2$

Grain in the first 2 minutes = $V_{t=2} - V_{t=0} = 4.4 - 0$

Grain = 4.4 m³

Questions 5 and 6 are Merit