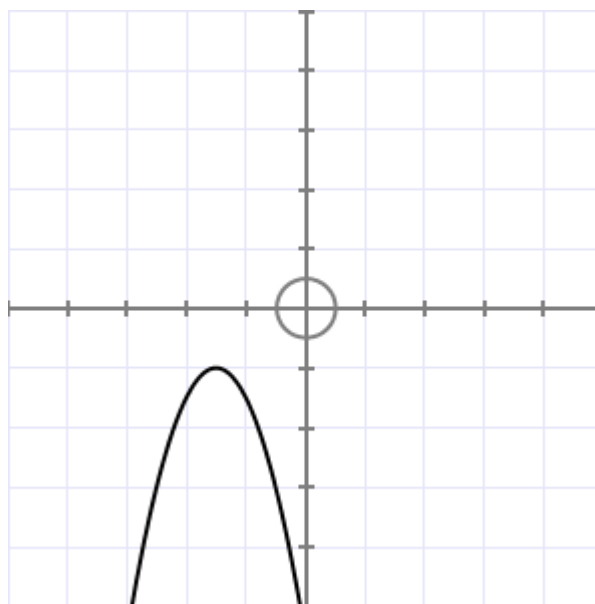


## L2 Calculus Revision #1

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  $2.4 \text{ m}^3$  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

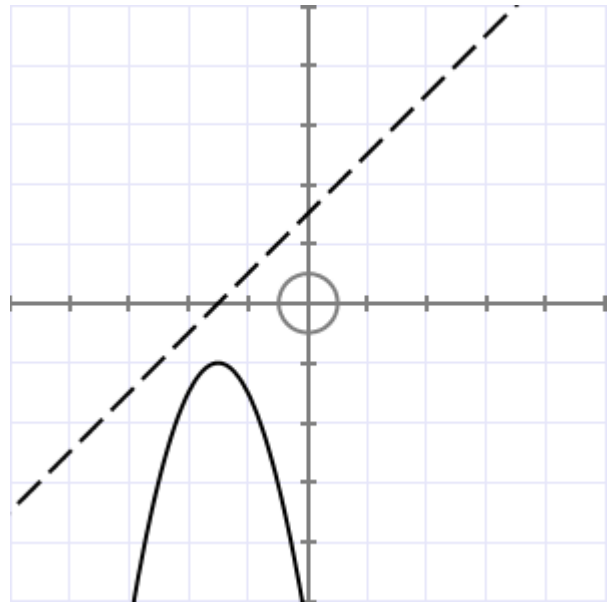
1.  $y = 3x^2 - 8x + 5$  so  $\frac{dy}{dx} = 6x - 8$

At  $x = 2$ ,  $= 6 \times 2 - 8 = 4$

**Gradient = 4**

2. **Drawn**

- It must be
- a straight line
  - any positive 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 =  $4.4 \text{ m}^3$**

Questions 5 and 6 are Merit