

L2 Calculus Practice #3

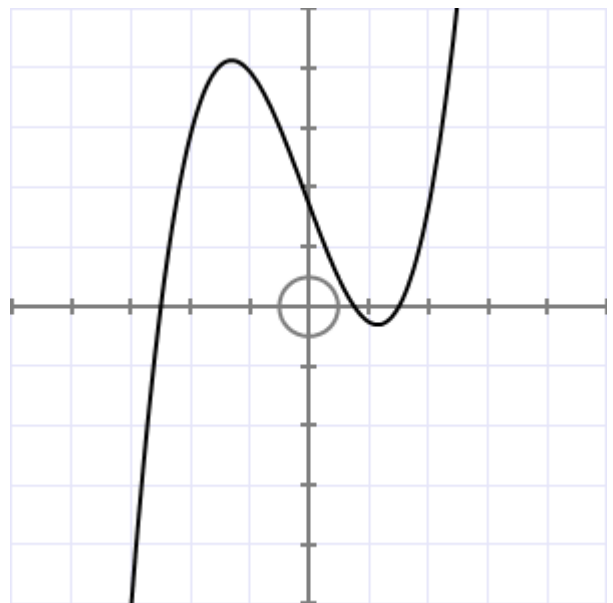
1. For a function you know that $f'(x) = x^2 - 4x + 5$ and that $f(3) = 4$

Find the equation of the function.

2. The point $(-2, 4)$ lies on the curve $y = 3x^2 + 2x - 4$.

Find the gradient of the tangent to the curve at point .

3. Indicate where on the graph to the right the gradient function is zero.



4. A parabola has equation $y = \frac{x^2}{4} + 2x - 4$

Find the value of x where the slope of the curve is 3.5

5. Find the equation of the tangent to the curve $y = \frac{x^3}{2} + \frac{4x}{5}$ when $x = 2$.

6. For 14 days the height of a slag heap grows with a rate, $\frac{dh}{dt} = 2.7 - 0.2t$

where h is height in metres and t is time in days

The heap starts at 6 metres high.

When does the heap reach 20 metres high?



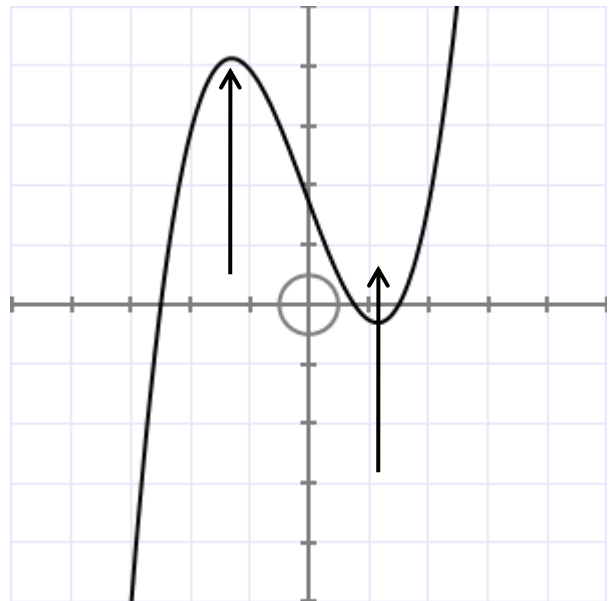
Answers: L2 Calculus Practice #3

1. $f'(x) = x^2 - 4x + 5$ so $f(x) = \frac{1}{3}x^3 - 2x^2 + 5x + C$
 $f(3) = 4$ so $f(3) = \frac{1}{3} \times 3^3 - 2 \times 3^2 + 5 \times 3 + C = 4$. so $C = -2$

Equation is $f(x) = \frac{1}{3}x^3 - 2x^2 + 5x - 2$

2. $y = 3x^2 + 2x - 4$ so $\frac{dy}{dx} = 6x + 2 = \text{curve's gradient} = \text{tangent's gradient}$
 Gradient at $x = -2$ is $\frac{dy}{dx} = 6 \times -2 + 2 = -10$ **Gradient = -10**

3. Both points marked with arrows.



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

Point where gradient = 3.5 is when

$3.5 = \frac{1}{2}x + 2$ Point at $x = 3$

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

At $x = 2$ we can say that gradient, $m = 1.5 \times 2^2 + 0.8 = 6.8$

At $x = 2$ original graph passes through $(2, 5.6)$ as $0.5 \times 2^3 + 0.8 \times 2 = 5.6$

Use $y - y_1 = m(x - x_1)$ to find the equation. Tangent at $y = 6.8x - 8$

6. $\frac{dh}{dt} = 2.7 - 0.2t$ so $h = 2.7t - 0.1t^2 + C$

The heap starts at 6 metres high so $6 = 2.7 \times 0 - 0.1 \times 0 + C$ so $C = 6$

To find when $h = 20$ $20 = 2.7t - 0.1t^2 + 6$ $2.7t - 0.1t^2 - 14 = 0$

Rearranging $0.1t^2 - 2.7t + 14 = 0$ Solutions at $t = 20$ and $t = 7$

Told only applies for 14 days, so ignore $t = 20$ **Reaches 20 metres at day 7**

Questions 5 and 6 are Merit