Exercise 1 Calc. : ✓

Consider a rapid test to determine infection with a certain disease. We know that someone who has the disease will be correctly diagnosed 96% of the time. Someone who does not have the disease will be falsely diagnosed, a false positive, 2% of the time.
The disease is prevalent in 0.4% of the population.

1. A patient takes a test. Calculate the probability that they will get a positive result. — 3 marks
2. The test result comes back positive. Calculate the probability that the patient has the disease given that they got a positive result. — 4 marks

Exercise 2 Calc. : ✓

When you play roulette at a casino, we can bet on one of the 37 numbers from 0 to 36. Alternatively you can bet on the colour red or black (0 is coloured green).
For the remainder of the question, consider a bet of €100.

1. If you bet on red and the ball falls on one of the 18 red compartments, your money is doubled.
   Calculate the Expected value of the random variable X: « amount won betting on red ». — 3 marks
2. Compare this value with the Expected value of the random variable Y: « Amount won betting on a specific number ». If the ball stops in the compartment you have bet on, you receive 36 times what you bet. — 4 marks

Exercise 3 Calc. : ✓

From a group of 10 runners and 15 non-runners, a university researcher selects 5 people for a study on cardio-vascular disease.

1. How many groups is it possible to make if we make no distinction between the runners and the non-runners? — 3 marks
2. How many groups is it possible to make if we want exactly three runners participating in the study? — 3 marks
3. What is the probability that, given a random selection of participants in the study, that there would be exactly three runners in the group? — 4 marks

Exercise 4 Calc. : ✓

Consider the function f defined by $f(x) = -\frac{x^3}{3} - \frac{x^2}{2} + 6x + 4$.

1. Determine an expression for f', the derivative of the function f. — 4 marks
2. Study the sign of f' (make a sign table). — 6 marks
3. Determine the interval in which the function f is increasing. — 4 marks

Exercise 5 Calc. : ✓

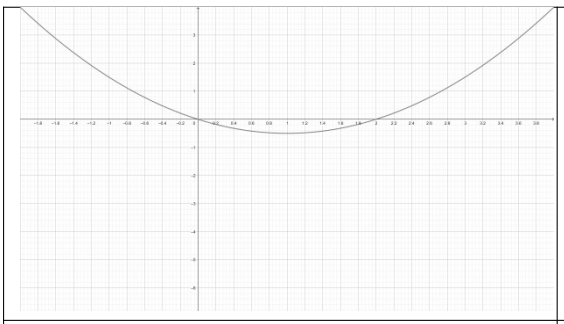
The function $f(x) = 60\sin\left(\frac{2\pi}{30}(t - 7,5)\right) + 75$ can be used to model the height of a passenger above the ground on the London Eye, where t is the time in minutes after departure.

1. Determine the period of the London Eye. — 2 marks
2. Determine the amplitude of the London Eye. — 3 marks
3. Use this function to estimate the height of a passenger 18 minutes after departure. — 2 marks
4. What height above the ground is the boarding platform? — 3 marks
5. Sketch the graph of the function $f(x)$. — 4 marks
6. Use your graph to estimate how long a passenger would spend more than 100 m above the ground. — 3 marks

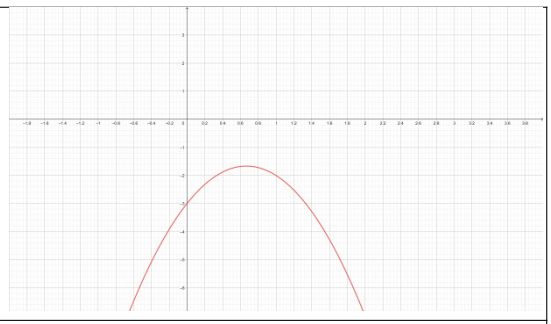
Exercise 6 Calc. : ✓

Below are three functions labelled A, B, C, D and E and their derivatives labelled I, II, III, IV and V.

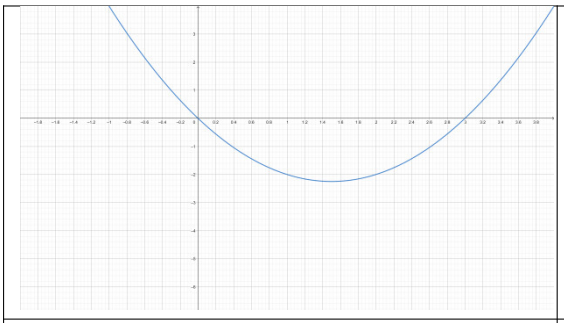
Match each function to its corresponding derivative. 9 marks



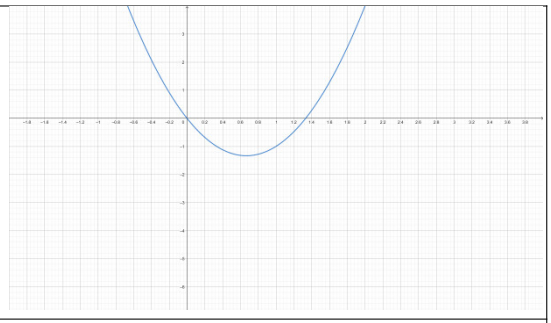
A



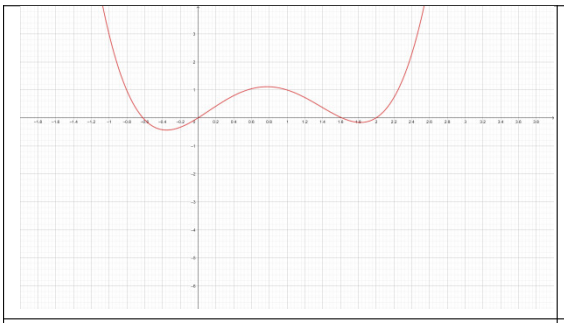
I



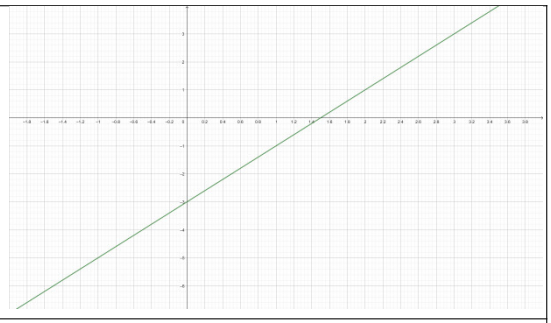
B



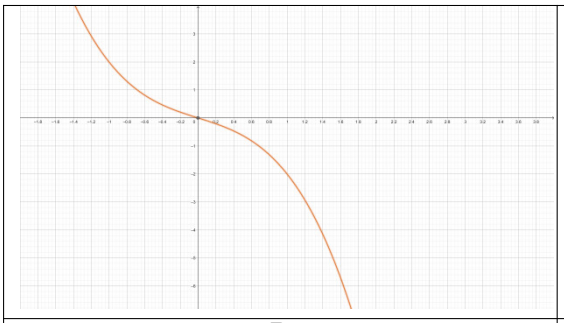
II



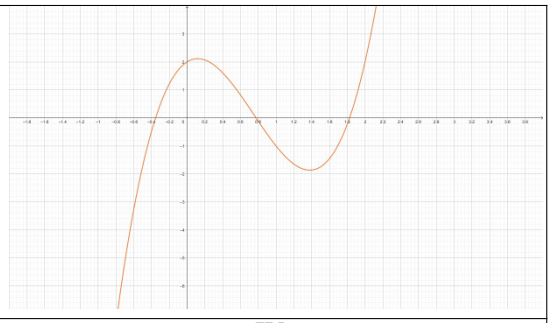
C



III

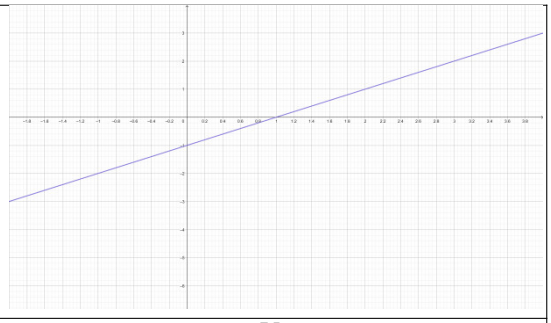


D



IV

E



V