Exercise 1 Calc. : ✓

La température mensuelle d'une région est modélisée par la fonction :

$$T(x) = 19,5\cos\left(\frac{\pi}{6}(x-7)\right) + 0,5$$

où x est le rang du mois dans l'année (en janvier, $x = 1$).

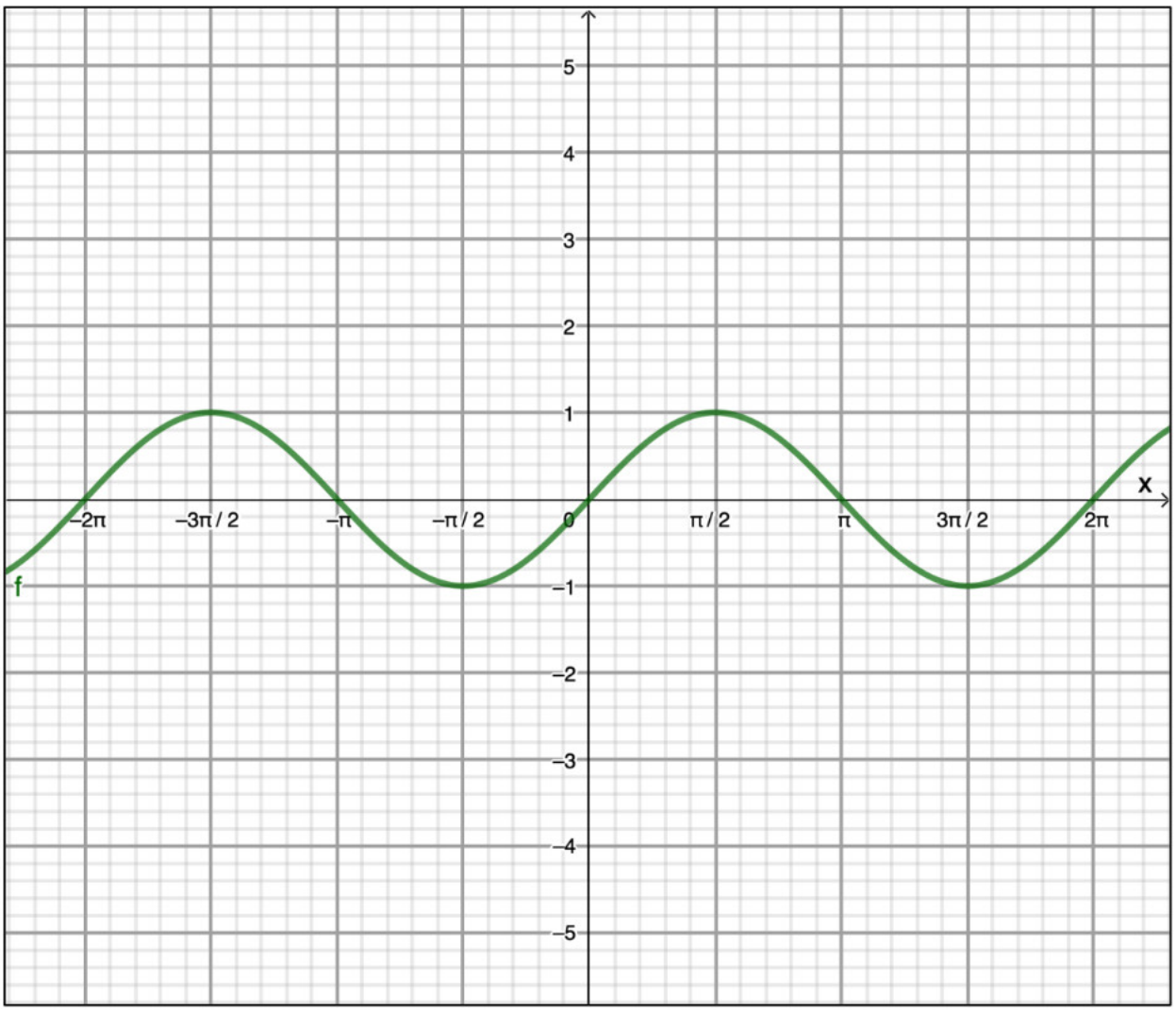
2 marks 1. Montrer que la période de cette fonction est 12.

1 mark 2. Déterminer la température mensuelle minimale.

3 marks 3. Déterminer la température mensuelle en décembre.

Exercise 2 Calc. : ✗

5. Given the function $f(x) = \sin(x)$. **4 marks**



a) Determine amplitude, period and midline of the function $g(x) = 2\sin\left(\frac{5}{2}x\right) - 1$. 1.5 marks

b) On the diagram above, draw the graph of $g(x)$. 2.5 marks

Exercise 3 Calc. : ✓

15 marks

Rimini's Ferris wheel has 42 transparent capsules that reach an altitude of 55 m from where you can see the Romagna coast, from Gabicce to Cesenatico.
The ticket costs 9 € and the trip lasts 30 minutes, during which the wheel completes 5 turns.
The motion of a capsule is described by the function

$$h(t) = 28 - 27\cos\left(\frac{\pi}{3}t\right)$$

where h is the altitude of the capsule in metres and t is time in minutes, with $t = 0$ when the trip starts.

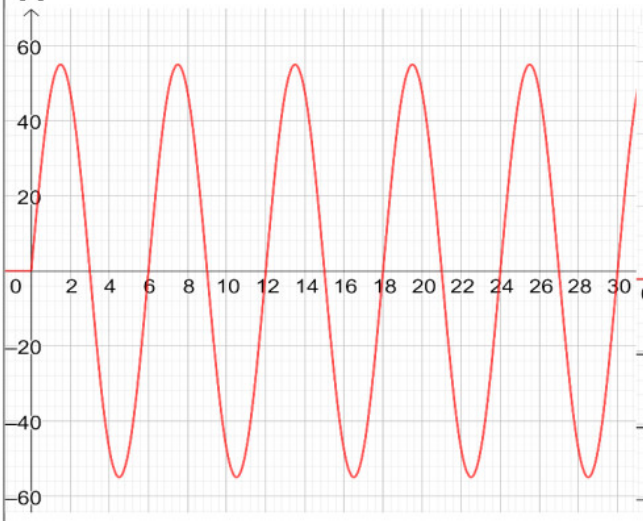
a) Determine the time taken for a complete turn and explain the meaning of the coefficient $\frac{\pi}{3}$ in the equation of $h(t)$. — 2 marks

b) Check that the maximum altitude is 55 m and determine after how many minutes is attained. — 3 marks

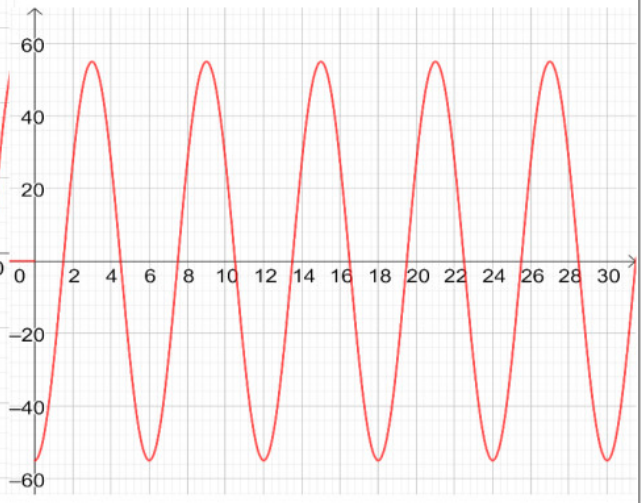
c) Determine the altitude of the capsule when the trip starts, hence determine the radius of the wheel. — 2 marks

d) Among the following diagrams, find the one that represents the graph of the function $h(t)$. Justify your answer. — 2 marks

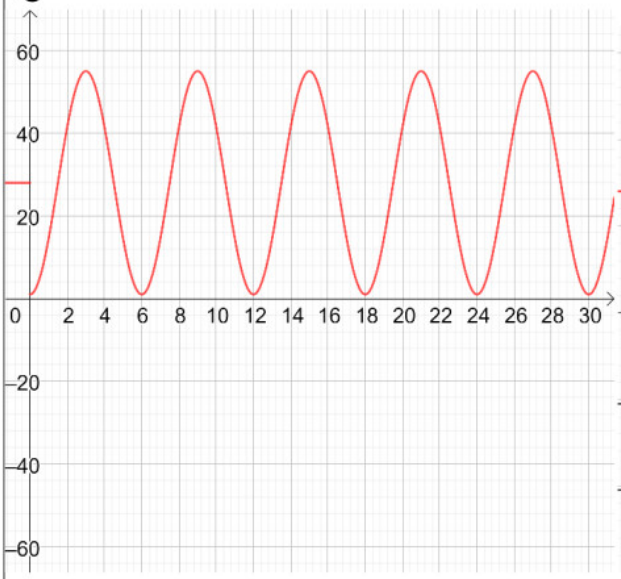
A



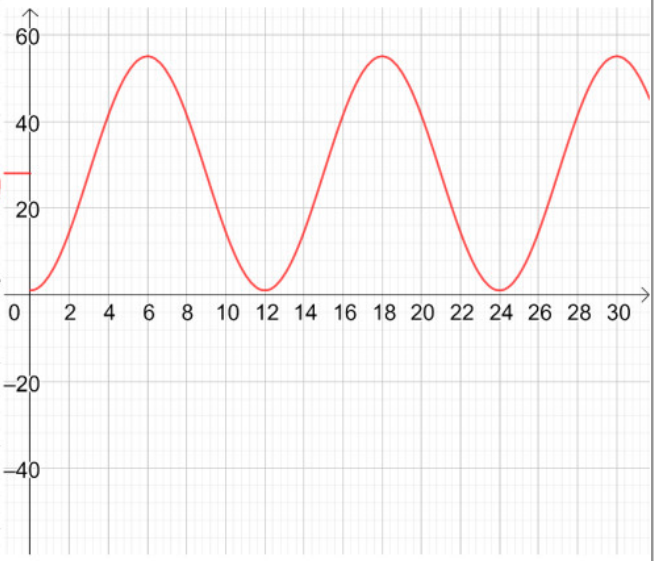
B



C



D



e) Determine the altitude of the capsule after 2 minutes. — 2 marks

f) Determine the time in minutes when the capsule reaches an altitude of 14.5 m from the ground. — 3 marks