Question 1

Given the following functions:

$$f(x) = x^2 + 3$$
$$g(x) = -\sqrt{x+2}$$
$$h(x) = \frac{2}{x+1}$$
$$i(x) = |x+3| - 2$$

Find the following equations:

a) $f \circ g(x)$

b) $g \circ f(x)$

c) $i \circ j(x)$

d) $j \circ i(x)$

Question 2

Using the equations from Question 1, evaluate the following compositions:

a) $g \circ f(3) =$

b) $f \circ g(-1) =$

c) $i \circ j(3) =$

d) $j \circ i(-2) =$

Question 3

Solve the following inequalities algebraically, and give your solution using interval notation.

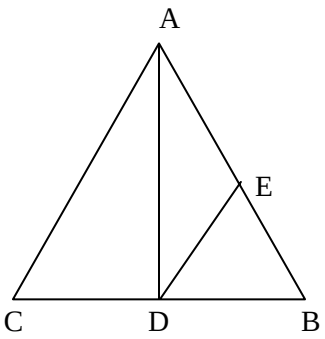
a) $-0.2\left|x-200\right|+400 \geq -150$

b) $3\sqrt{x-2}+1<9$

c) $\frac{x^2}{5}-\frac{7x}{10}+2<0,2$

Question 4

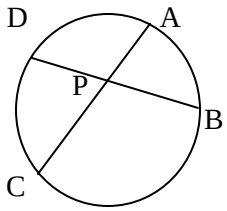
Triangle ABC is isosceles. Segment AD is the altitude from A to side BC. AD measures 12 units, and AC measures 13 units. Find the measure of AE if DE is the bisector of angle ADB.



Question 5

Find the missing measure in each of the circles below. Show all your work, and reference the theorem used to calculate the missing measures.

a)



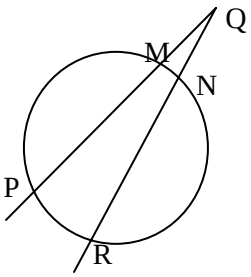
$m\overline{PD} = 2{,}4\,cm$

$m\overline{PC} = 4\,cm$

$m\overline{AC} = 7\,cm$

$m\overline{BP} = ?$

b)



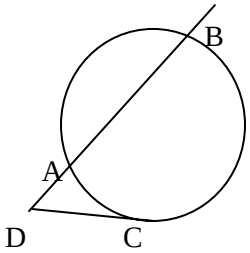
$m\overline{MQ} = \sqrt{11}$

$m\overline{PM} = 2\sqrt{14}$

$m\overline{NQ} = \sqrt{13}$

$m\overline{NR} = ?$

c)



$m\overline{AD} = 12{,}5\,m$

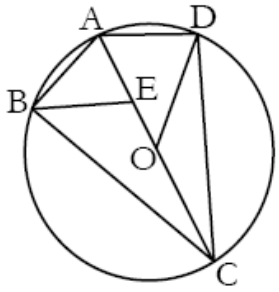
$m\overline{AB} = 37{,}5\,m$

$m\overline{DC} = \quad ?$

Question 6

In the following figure, AC is a diameter and BE is a bisector. Given the following measures, calculate the measure of the following segments and justify your answer.

mAB = 5mm
mBC = 12mm
mAB = mAD



a) $m\overline{OD}$

b) $m\overline{AE}$

Question 7

In triangle ABC, BE is a bisector and BD is an altitude. Determine if the following statements are true or false.

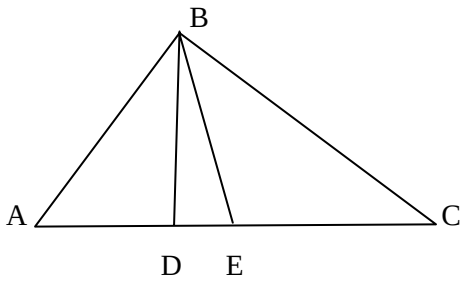
a) $\overline{AB} \cdot \overline{EC} = \overline{AE} \cdot \overline{BC}$

b) $\overline{AB}^2 = \overline{AE} \cdot \overline{AC}$

c) $\overline{AD} \cdot \overline{DC} = \overline{AB} \cdot \overline{BC}$

d) $\overline{BD}^2 = \overline{AD} \cdot \overline{DC}$

e) $\overline{AB} \cdot \overline{BC} = \overline{BD} \cdot \overline{AC}$



Question 8

During a road test, the a car is accelerated and decelerated regularly following the following function:

$$v(t) = 30 - \left| \frac{3t - 120}{4} \right|$$

Where *v(t)* represents the speed (in m/s) reached after *t* seconds. The test lasts exactly one minute. During what interval, in seconds, is the speed of the car greater than or equal to 10 m/s? Show all your work clearly.

Question 9

Following a power failure, the interior temperature of a house varies according to the following rule:

$$T(h) = -2\sqrt{h} + 20$$

Where *T(h)* represents the interior temperature after *h* hours in degrees Celsius. What is the minimum length of the power failure for the house to reach freezing (0°C)?

Clearly show all your work.

Question 10

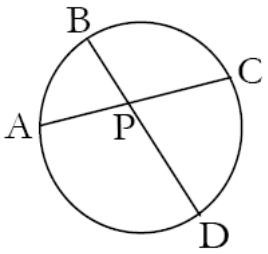
Complete the following proof.

Prove that:

When two chords intersect within a circle, the product of the lengths of the segments of one chord equals the product of the lengths of the segments of the other.

Hypothesis: Given two chords in a circle, AC and BD, intersecting at point P, located within the circle.

Conclusion: $m\overline{PA} \times m\overline{PC} = m\overline{PB} \times m\overline{PD}$

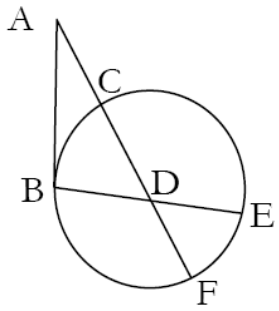


Statement	Justification
1. $m\angle APD = m\angle BPC$	
2. $m\angle PDA = m\angle PCB$	
3. Triangles APD and BPC are similar	
4. Therefore, $\frac{m\overline{PA}}{mPB} = \frac{m\overline{PD}}{mPC}$	
5. Conclusion: $m\_\_\_ \times m\_\_\_ = m\_\_\_ \times m\_\_\_\_$	

Question 11

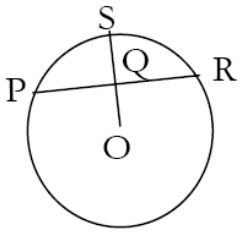
Given a circle with centre O, point B is the point of tangency of segment AB. A is situated along the extension of chord CF. CF intersects chord BE at point D. Using the following measures, determine the length of segment DE.

$\overline{AC} = 3$ *unités*
$\overline{AB} = 6$ *unités*
$\overline{CD} = x$
$\overline{BD} = 4$ *unités*
$\overline{DF} = x - 2$



Question 12

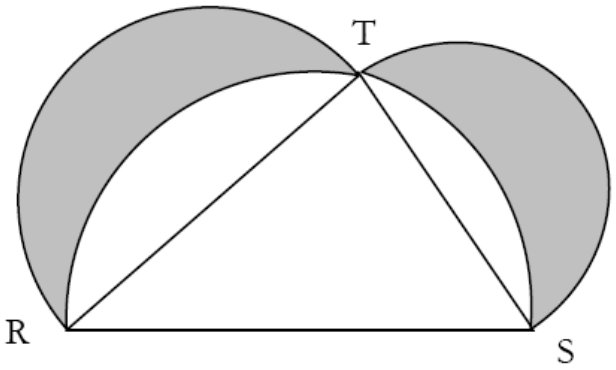
In the following circle, chord PR is perpendicular to radius OS . Show that arc SP is congruent to arc RS.



Statement	Justification
1.	
2.	
3.	
4.	
5.	

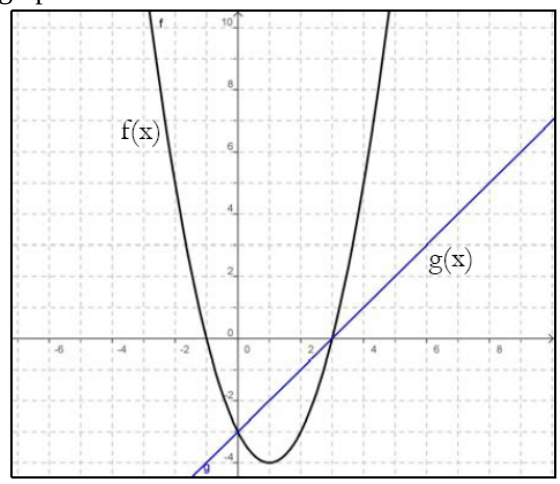
Question 13

Below is a representation of Hippocrates' lunules, on the legs of right triangle RST. Calculate the perimeter of these lunules, knowing that the hypotenuse measures 7 cm and one of the acute angles in the triangle is 60°.



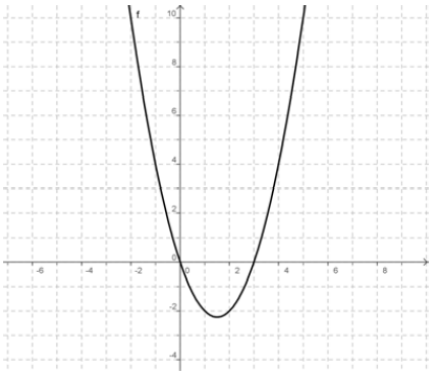
Question 14

Given functions *f* and *g*, graphed below:

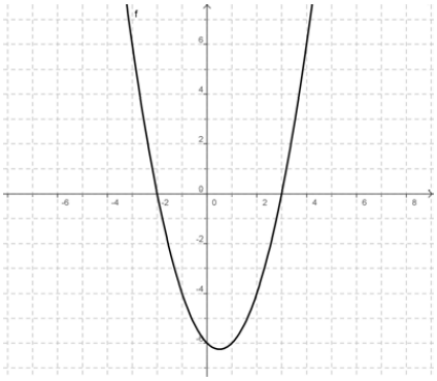


Which of the following graphs represents $(f/g)(x)$?

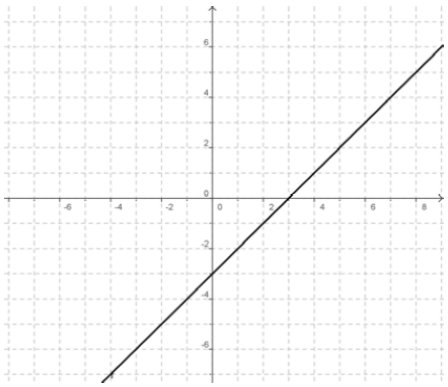
a)



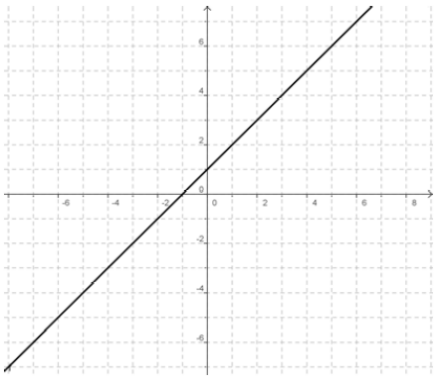
b)



c)



d)



Question 15

Given functions $j(x) = \log_3(2x-3)$ and $k(x) = \frac{1}{2}x + 3$, determine if the following statemtns are true or false. The composition $j \circ k(x)$ is a function.

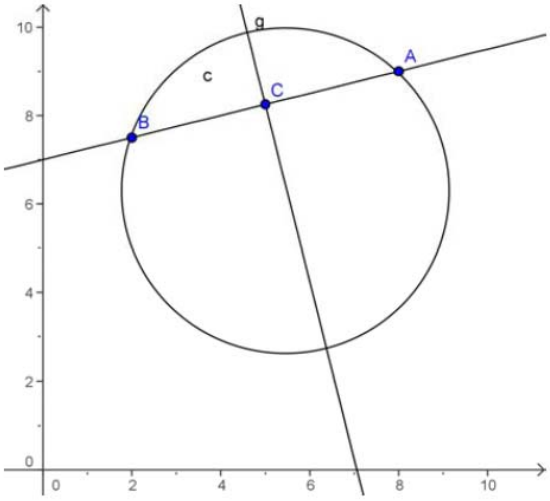
a) The composition $j \circ k(x)$ and function *j(x)* are increasing over $x \in \Re^+$.

b) The composition $j \circ k(x)$ and function *k(x)* are negative over $\left]-\frac{3}{2},-1\right[$.

c) The composition $j \circ k(x)$ and function *j(x)* share the same domain.

Question 16

The linear function $f(x) = \frac{x}{4} + 7$ intersects a circle at x-values 2 and 8. The chord that is coincident on this line is located at a distance of 2 units from the centre of the circle. What is the diameter of the circle? Show all your work.



Question 17

Given $f(x) = 3x + 4$ and $g(x) = 5x - 7$. Function *h* is defined by:

$$h(x) = \frac{f(x)}{g(x)} \text{ ou } g(x) \neq 0$$

Determine if the following statements are true or false.

a) Dom *f* = $\mathbb{R}$ and Dom *h* = $\mathbb{R} \setminus \left\{\frac{3}{5}\right\}$

b) Ran *f* = $\mathbb{R}$ and Ran *h* = $\mathbb{R} \setminus \left\{-\frac{7}{5}\right\}$

c) Dom *g* = $\mathbb{R} \setminus \left\{-\frac{7}{5}\right\}$ and Dom *h* = $\mathbb{R}$

d) Ran *g* = $\mathbb{R}$ and Ran *h* = $\mathbb{R} \setminus \left\{\frac{3}{5}\right\}$