BECA / Huson / 12.1 IB Math SL Name:
6 March 2019

Problem set: Trig free response questions

1. Solve the equation $2\cos x = \sin 2x$, for $0 \leq x \leq 3\pi$. *[7 marks]*

2a. Let $f(x) = \cos\left(\frac{\pi}{4}x\right) + \sin\left(\frac{\pi}{4}x\right),\ \text{for}\ -4 \leqslant x \leqslant 4.$

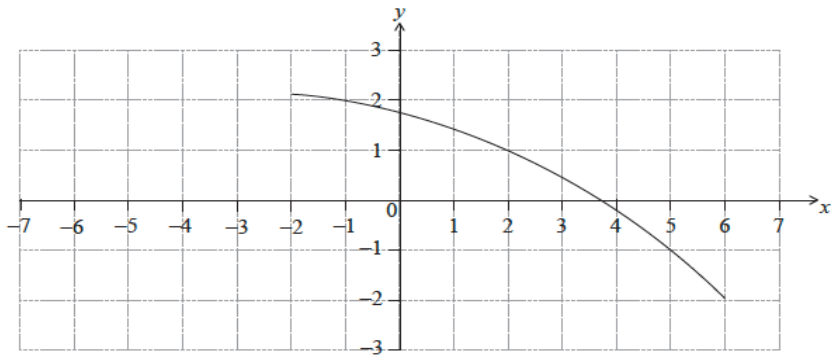
Sketch the graph of f. *[3 marks]*

2b. Find the values of x where the function is decreasing. *[5 marks]*

2c. The function f can also be written in the form $f(x) = a\sin\left(\frac{\pi}{4}(x+c)\right)$, where $a \in \mathbb{R}$, and $0 \leqslant c \leqslant 2$. Find the value of a; *[3 marks]*

2d. The function f can also be written in the form $f(x) = a\sin\left(\frac{\pi}{4}(x+c)\right)$, where $a \in \mathbb{R}$, and $0 \leqslant c \leqslant 2$. Find the value of c. *[4 marks]*

3a. The following diagram shows the graph of a function f.



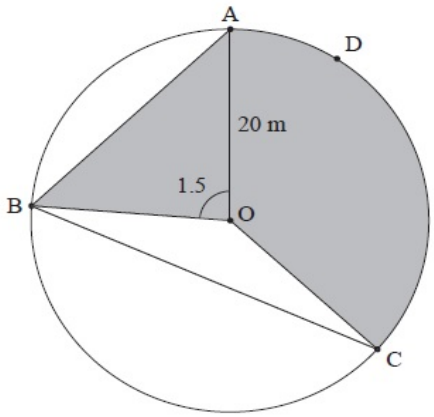
Find $f^{-1}(-1)$. *[2 marks]*

3b. Find $(f \circ f)(-1)$. *[3 marks]*

3c. On the same diagram, sketch the graph of $y = f(-x)$. *[2 marks]*

4a. *[3 marks]*

The following diagram shows a circular play area for children.



The circle has centre O and a radius of 20 m, and the points A, B, C and D lie on the circle. Angle AOB is 1.5 radians.

Find the length of the chord [AB].

4b. *[2 marks]*

Find the area of triangle AOB.

4c. *[3 marks]*

Angle BOC is 2.4 radians.

Find the length of arc ADC.

4d. *[3 marks]*

Angle BOC is 2.4 radians.

Find the area of the shaded region.

4e. *[4 marks]*

Angle BOC is 2.4 radians.

The shaded region is to be painted red. Red paint is sold in cans which cost $\$32$ each. One can covers $140\ \text{m}^2$. How much does it cost to buy the paint?