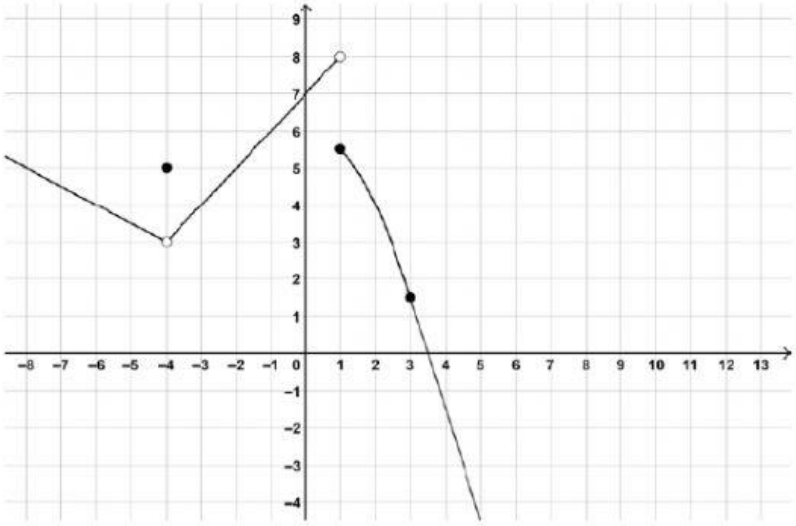
QUESTION 6

Consider the function, *f*, defined as follows:

$$f(x)=\begin{cases}-0,5x+1 & x<-4\\ 5 & x=-4\\ x+7 & -4<x<1\\ -0,5x^2+6 & 1\le x\le 3\\ ax+b & x\ge 3\end{cases}$$

f is depicted in the graph below:



6.1 Identify, by means of their *x*-coordinates, any points of discontinuity. You should also classify the discontinuity and justify your classifications mathematically. Pay careful attention to notation. (6)

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6.2 Determine a and b if f is differentiable at $x = 3$. (8)

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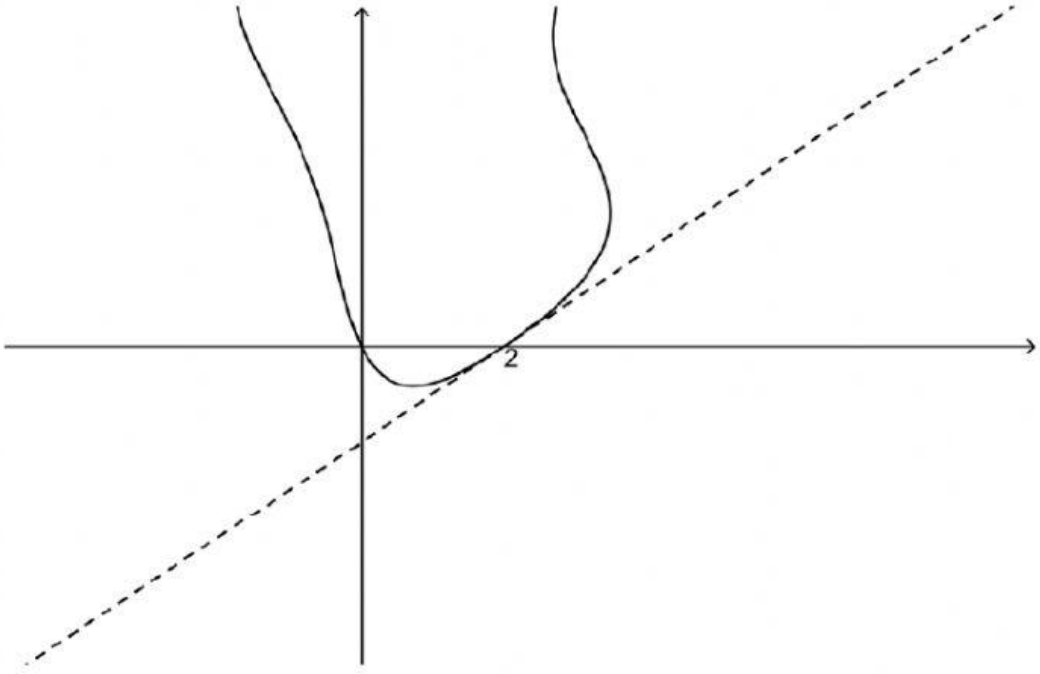
QUESTION 7

A portion of the implicitly defined curve $x^2 - x\sin y = y + 2x$ is shown below.

Determine the equation of the tangent to the curve at the point $(2\,;0)$.



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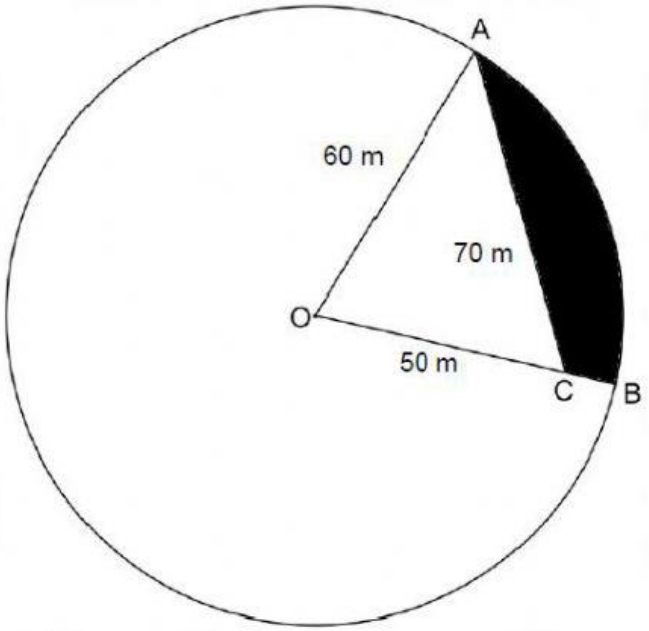
QUESTION 8

[Source: <https://www.northwesthydro.com.au/blog/solar-pumping-for-centre-pivot-irrigation/>]

The sketch below is of a circular field with a centre pivot irrigation system on it. O is the centre and OCB is a straight line. OA is 60 m and OC is 50 m. AC is 70 m.



An aerial photo of the field has shown that the shaded area is infected with weeds. What percentage of the field is infected?

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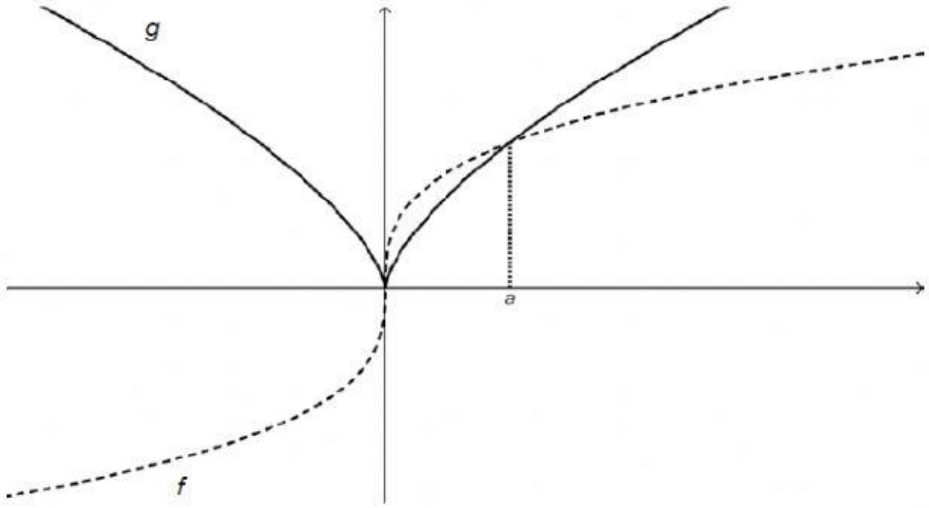
QUESTION 9

9.1 Consider the two functions below:

f is an **odd** function since $f(-x) = -f(x)$ while g is an **even** function since $g(-x) = g(x)$. To help you distinguish them, f has been drawn with a dotted line and g with a solid line. f and g intersect at $x = a$.



If it is further given that $\int_0^a f(x)dx = 0{,}75$ and $\int_0^a g(x)dx = 0{,}6$ then determine the following:

(a) $\int_0^a f(x) - g(x)\,dx$ (2)

(b) $\int_{-a}^0 f(x) + g(x)\,dx$ (3)

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(c) $\int_{-a}^{a} 2f(x)+3g(x)\,dx$ (4)

(d) $\int_{-a}^{a} f(|x|)\,dx$ (3)

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