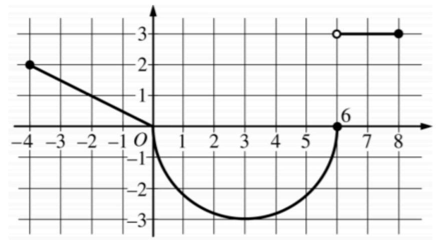
NO CALCULATOR IS ALLOWED FOR THIS QUESTION.



Graph of g

1. The function g is defined on the closed interval $[-4,8]$. The graph of g consists of two linear pieces and a semicircle, as shown in the figure above. Let f be the function defined by $f(x) = 3x + \int_0^x g(t)dt$

   (a) Find $f(7)$ and $f'(x)$

   (b) Find the value of x in the closed interval $[-4,3]$ at which f attains its maximum value. Justify your answer.

(c) For each of $\lim_{x \to 0^-} g'(x)$ and $\lim_{x \to 0^+} g'(x)$, find the value or state that it does not exist.

(d) Find $\lim_{x \to -2} \frac{f(x) + 7}{e^{3x+6} - 1}$

NO CALCULATOR IS ALLOWED FOR THIS QUESTION.

2. Unless otherwise specified, the domain of a function f is assumed to be the set of all real numbers x for which $f(x)$ is a real number.

$$f(x) = \begin{cases} \sqrt{9 - x^2} & -3 \le x \le 0 \\ -x + 3\cos\left(\frac{\pi x}{2}\right) & 0 < x \le 4 \end{cases}$$

Let f be the function defined above.

(a) Find the average rate of change of f on the interval $-3 \le x \le 4$.

(b) Write an equation for the line tangent to the graph of f at $x = 3$

(c) Find the average value of f on the interval $-3 \leq x \leq 4$ (Calculator permitted for this part)

(d) Must there be a value of x at which $f(x)$ attains an absolute maximum on the closed interval $-3 \leq x \leq 4$? Justify your answer.