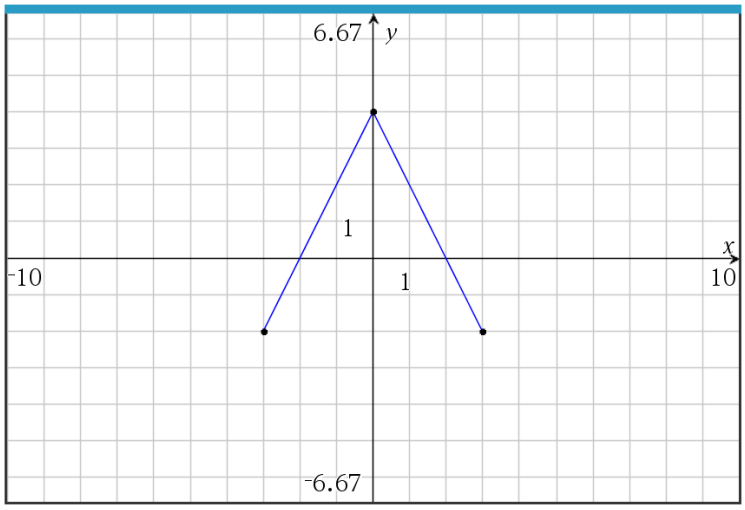
1. The graph of the function f is shown below.



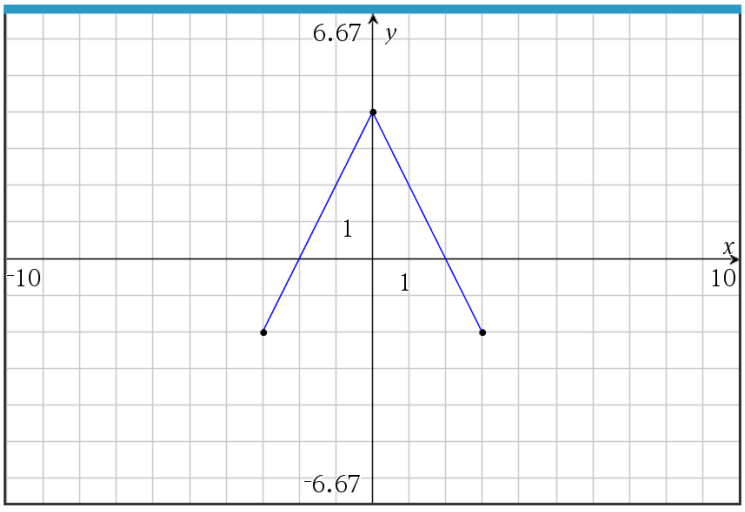
Let g be the function given by $g(x) = \int_0^x f(t)\,dt$.

(a) Find $g(2)$, $g'(2)$, and $g''(2)$. (3 marks)

(b) Find the interval(s) within $(-3, 3)$ where g is decreasing. (2 marks)

(c) Find the interval(s) within $(-3, 3)$ where the graph of g is concave down. Explain your reasoning. (2 marks)

(d) On the axes below, sketch the graph of g on the closed interval $[-3,3]$. (3 marks)



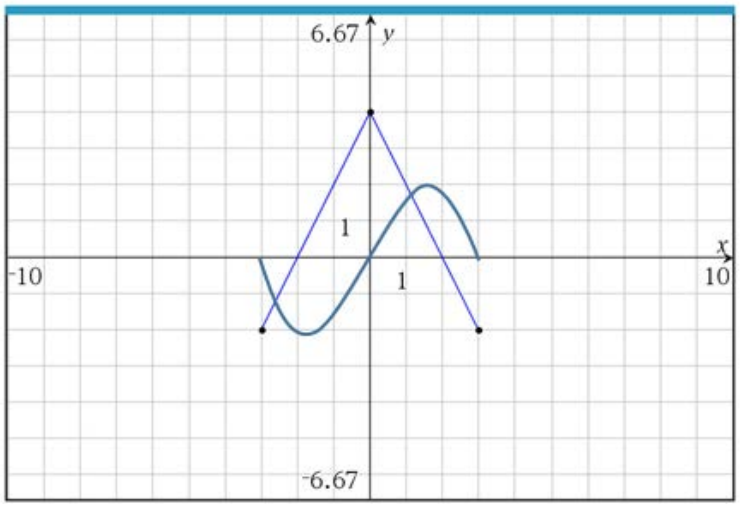
Mark scheme:

(a) $g(2) = \int_0^1 f(t)dt = -\int_{-1}^0 f(t)dt = -4$ (A1)

(b) g is decreasing on $-3 < x < -2$ and $2 < x < 3$ (A1)
$g'(x) = f(x) < 0$ on these intervals (R1)

(c) The graph is concave down on $0 < x < 3$. This is true because $g''(x) = f'(x) < 0$ on this interval, or because $g'(x) = f(x)$ is decreasing on this interval. (A1) (R1)

(d)



$g(-3) = g(0) = g(3) = 0$ (A1)
Appropriate increasing/decreasing and concavity behavior. (A1)