Question 7 (9 marks)

Figure 6 shows the graphs of $y = f(x)$ and $y = g(x)$ for $0 \le x \le 7$.

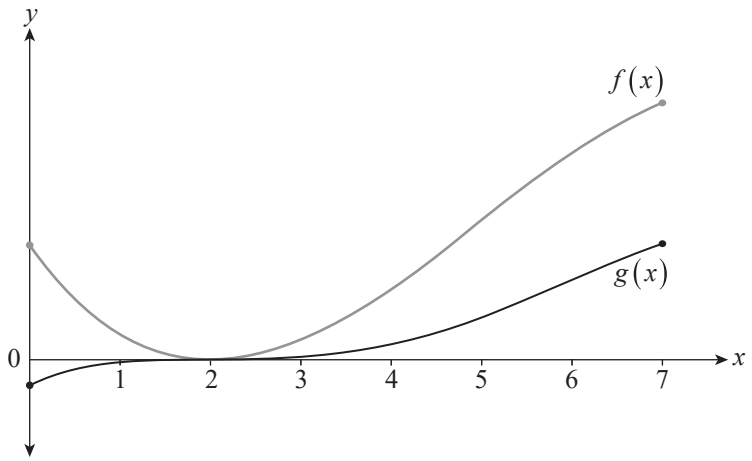

Figure 6

The graph of each function has exactly one stationary point; it is located at $x = 2$.

(a) State the nature of the stationary point for the graph of $y = f(x)$ at $x = 2$.

(1 mark)

(b) Figure 7 shows the sign diagram for the second derivative of the function $g(x)$.

Figure 7

State the nature of the point that is located at $x = 2$ on the graph of $y = g(x)$.

(1 mark)

(c) The graph of $y = f(x)$ in Figure 6 has one point of inflection at $x = 5$.
Determine the interval(s) for which $f'(x)$ is increasing.

(1 mark)

(d) (i) For $0 < x < 2$, which *one* statement is true? Tick the appropriate box.

$f'(x) < g'(x)$ ☐ $f'(x) = g'(x)$ ☐ $f'(x) > g'(x)$ ☐ (1 mark)

(ii) For $0 < x < 2$, which *one* statement is true? Tick the appropriate box.

$f''(x) < g''(x)$ ☐ $f''(x) = g''(x)$ ☐ $f''(x) > g''(x)$ ☐ (1 mark)

(iii) For $2 < x < 7$, given that the value of $f(x) - g(x)$ is increasing, which *one* statement is true? Tick the appropriate box.

$f'(x) < g'(x)$ ☐ $f'(x) = g'(x)$ ☐ $f'(x) > g'(x)$ ☐ (1 mark)

(e) Figure 8 shows the graph of $y = f'(x)$ for $0 \leq x \leq 7$.

On the axes in Figure 8, sketch a graph of $y = g'(x)$ for $0 \leq x \leq 7$.

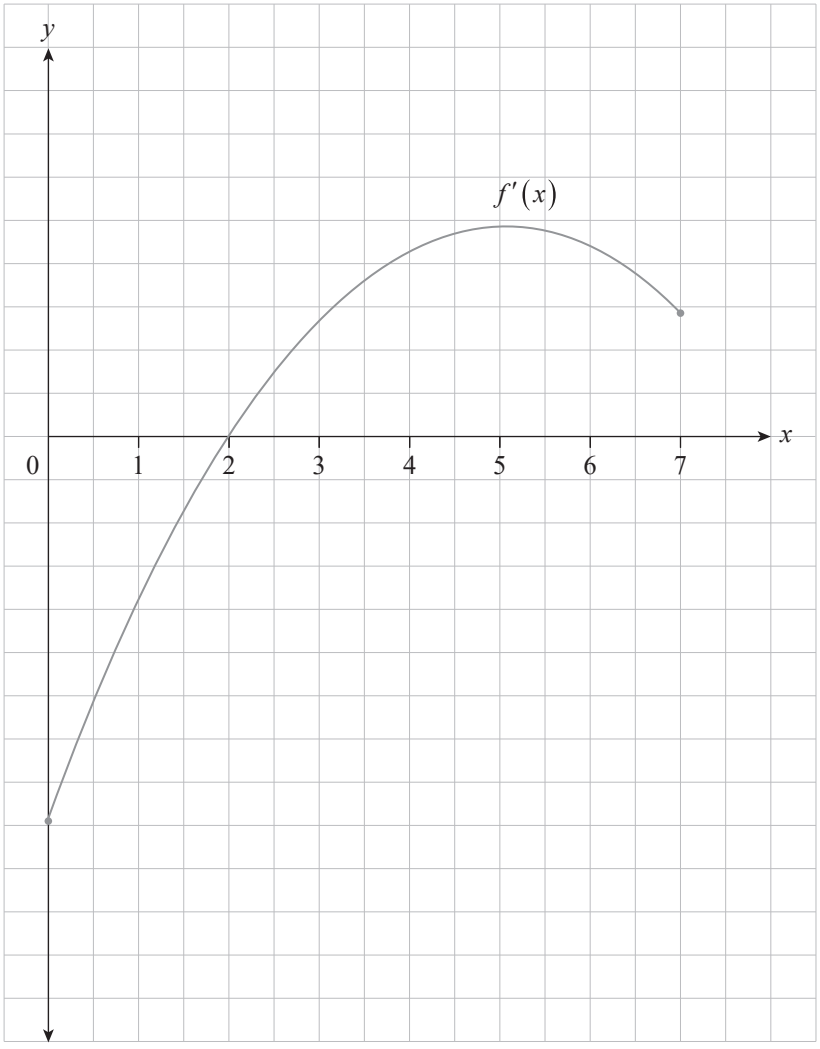

Figure 8

(3 marks)