Question 5 **(13 marks)**

The table below contains values of the polynomial function $f(x)$, its first and second derivatives, and the function $F(x) = \int_0^x f(t)\,dt$ for $x = 0, 1, 2, 3, 4, 5, 6$.

$f(x)$ has no stationary points at non-integer values of x, and the letters a, b, c, d and e represent unspecified constants.

	$x=0$	$x=1$	$x=2$	$x=3$	$x=4$	$x=5$	$x=6$
$f(x)$	a	b	4	c	0	d	e
$f'(x)$	16	0	–4	–2	0	–4	–20
$f''(x)$	–24	–9	0	3	0	–9	–24
$F(x)$	0	4.7	10.4	12.6	12.8	12.5	7.2

(a) Evaluate $\frac{d}{dx}\left(f(x)^2\right)$ when $x = 2$. (2 marks)

(b) Evaluate $\int_2^4 \left(f(x) + 2\right) dx$. (3 marks)

(c) Evaluate $\frac{d}{dx}\int_2^x f(t)\,dt$ when $x = 2$. (2 marks)

(d) Determine the x-coordinate of any stationary points and whether they are local maxima, local minima or inflection points. Justify your answer. (3 marks)

(e) Sketch a possible graph of $f(x)$ for $0 \leq x \leq 6$ on the axes below. (3 marks)