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1 (a) $f'(x) = 2x + 1$

(b) $g'(t) = \ln t + t \cdot \left(\frac{1}{t}\right) = \ln(t) + 1$

(c) $h'(u) = \dfrac{e^u \cdot u - e^u}{u^2} = \dfrac{(u-1)e^u}{u^2}$.

(d) $f'(w) = e^{w^2+1} \cdot (2w) = 2we^{w^2+1}$.

2 (a) $f'(x) = x^2 + 3x + 2$.

$f'(x) = 0$ where $(x+1)(x+2) = 0$, at $\boxed{x = -1}$ and $\boxed{x = -2}$.

(b) $f''(x) = 2x + 3$. When $x = -1$, $f''(x) = 2(-1) + 3 = 1 > 0$,
so $x = -1$ corresponds to a local minimum.
Similarly, $f''(-2) = 2(-2) + 3 = -4 + 3 = -1 < 0$,
so $x = -2$ corresponds to a local maximum.