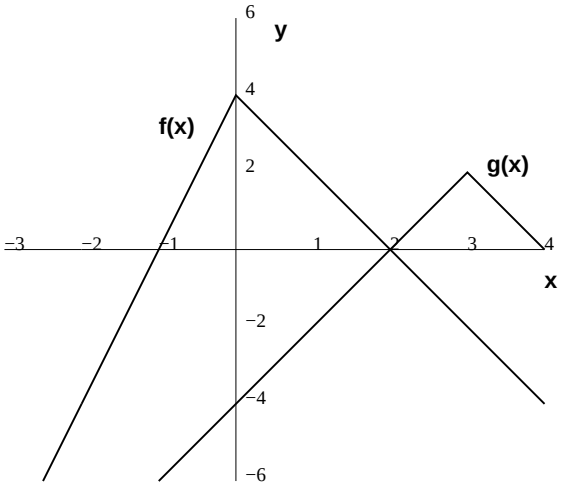
(3.) (16 points) The graphs of two functions f and g are shown below. [Note that the scales on the axes are not the same.]



(a) If $h(x) = f(g(x))$, compute $h'(1)$.

$$h'(1) = f'(g(1)) \cdot g'(1) = f'(-2) \cdot g'(1) = 4 \cdot 2 = 8$$

(b) If $k(x) = f(x) \cdot g(x)$, compute $k'(1)$.

$$k'(1) = f'(1) \cdot g(1) + f(1) \cdot g'(1) = -2 \cdot (-2) + 2 \cdot 2 = 8$$

(c) If $q(x) = \frac{f(x)}{g(x)}$, compute $q'(1)$.

$$q'(1) = \frac{g(1) \cdot f'(1) - f(1) \cdot g'(1)}{g^2(1)} = \frac{-2 \cdot (-2) - 2 \cdot (2)}{(-2)^2} = 0$$

(d) If $t(x) = \ln(g(x))$, compute $t'(1)$.

$$t'(1) = \frac{1}{g(1)} \cdot g'(1) = \frac{1}{-2} \cdot 2 = -1$$

Note: ln(g(x)) is only defined where g(x) is positive.
Therefore t (and hence t') are undefined at x=1.
This was an oversight of the test writer, but was caught during grading and graded correctly.