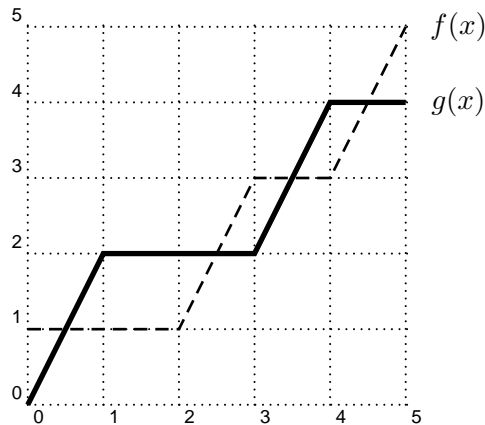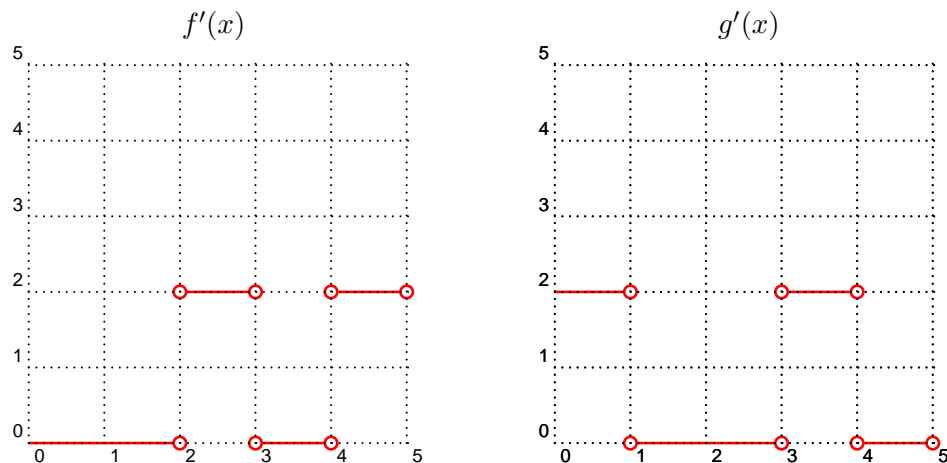8. (14 points) Use the functions $f(x)$ and $g(x)$ graphed below to answer the following questions:

(a) (3 points each) Graph $f'(x)$ and $g'(x)$.

(b) (2 points) Compute $h'(3)$ for $h(x) = f(g(x))$.

We have that $h'(3) = f'(g(3))g'(3)$, but we see that since $g'(3)$ is undefined, that we cannot compute $h'(3)$.

(c) (2 points) Define $r(x) = g(x) - f(x)$. For what x value(s) in $[0, 5]$ is $r(x)$ maximum?

The function $r(x)$ is maximum whenever $g(x)$ is most above $f(x)$, which happens for all x in $[1, 2]$, and at $x = 4$.

(d) (2 point) Find $s'(2.5)$ for $s(x) = f(x)g(x)$.

We have that $s'(2.5) = f'(2.5)g(2.5) + f(2.5)g'(2.5)$, and using the results of part (a), we find that $s'(2.5) = (2)(2) + (2)(0) = 4$.

(e) (2 points) Find $w'(2.5)$ for $w(x) = f(x)/g(x)$.

We have that $w'(2.5) = \dfrac{f'(2.5)g(2.5) - f(2.5)g'(2.5)}{(g(2.5))^2}$, and from part (a) again, we get

$w'(2.5) = \dfrac{(2)(2) - (2)(0)}{(2)^2} = 1.$