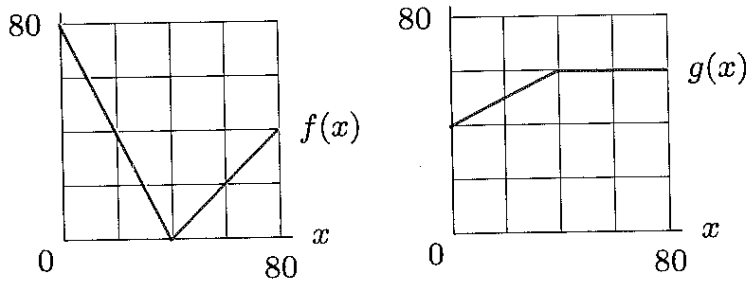
WEEKLY 6
APPLIED CALCULUS
DUE 10-01

Show your work! There are 6 total questions; be sure to check p. 2!

(1) Pictured below are the graphs of two functions $u = f(x)$ and $v = g(x)$.



(These are the same graphs as on Weekly #4, handout problem 1.) Find the value and derivative of $y = f(g(x))$ at the indicated points, if they exist.

(a) $y(10)$ and $y'(10)$.

(b) $y(40)$ and $y'(40)$.

(c) $y(70)$ and $y'(70)$.

(2) (a) The product rule for two functions states that

$$(uv)' = u'v + uv'.$$

Use this rule multiple times to come up with a product rule for three functions. That is, give a formula for $(uvw)'$.

(b) Use your rule from (a) to compute $\dfrac{\mathrm{d}y}{\mathrm{d}x}$, where $y = (8^{x^2}) \cdot [\ln(x)]^2 \cdot (e^{\sqrt{x}})$.

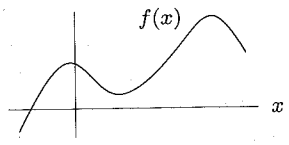
(3) The total revenue R obtained by selling x units at a price of p dollars each is $R = xp$. Suppose that $p = e^{-x}$.

(a) Compute the marginal revenue formula $\dfrac{\mathrm{d}R}{\mathrm{d}x}$.

(b) Use the chain rule to write down a relationship between $\dfrac{\mathrm{d}R}{\mathrm{d}x}$ and $\dfrac{\mathrm{d}R}{\mathrm{d}p}$.

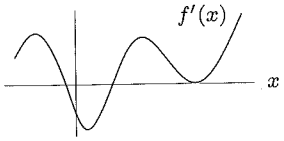
(c) Use your answers to (a) and (b) to find $\dfrac{\mathrm{d}R}{\mathrm{d}p}$.

(4) (a) For the function $y = f(x)$ graphed below,



where is $f(x)$ increasing? Where is it decreasing? Where are its local extrema, if any? Are they maxima or minima?

(b) Answer the same question for the function $y = f(x)$ whose **derivative** is graphed below.



This is **not** the graph of $y = f(x)$; it is also **not** the same function as in (a).

- **Two** book problem: #11.6.40; #11.7.65.