Math 1300-005 - Spring 2017

Product & Quotient Rule - 2/20/17

Guidelines: Please work in groups of two or three. This will not be handed in, but is a study resource for the next midterm.

1. Recall the product rule:

$$\frac{d}{dx}\big(u(x)v(x)\big) = u'(x)v(x) + u(x)v'(x).$$

Use it to differentiate the following. **You do not need to simplify your answers.**

(a) $f(x) = (x^3 + 2x)e^x$

(b) $g(x) = \sqrt{x}e^x$

(c) $R(t) = (t + e^t)(3 - \sqrt{t})$

(d) $F(y) = \left(\frac{1}{y^2} - \frac{3}{y^4}\right)(y + 5y^3)$

2. Find $f'(x)$ and $f''(x)$ for $f(x) = x^4e^x$.

3. Recall the quotient rule:

$$\frac{d}{dx}\left(\frac{u(x)}{v(x)}\right) = \frac{u'(x)v(x) - u(x)v'(x)}{[u(x)]^2}.$$

Use it to differentiate the following. **You do not need to simplify your answers.**

(a) $f(x) = \dfrac{e^x}{x^2}$

(b) $g(t) = \dfrac{2t}{4 + t^2}$

(c) $y = \dfrac{v^3 - 2v\sqrt{v}}{v + 1}$

(d) $h(x) = \dfrac{1 - xe^x}{x + e^x}$

4. Find an equation of the tangent line to $y = \dfrac{\sqrt{x}}{x + 1}$ at $x = 4$.

5. A table of values for f, g, f', and g' is given.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
1	4	-6	5	7
2	-1	2	-3	-4
3	0	1	6	3

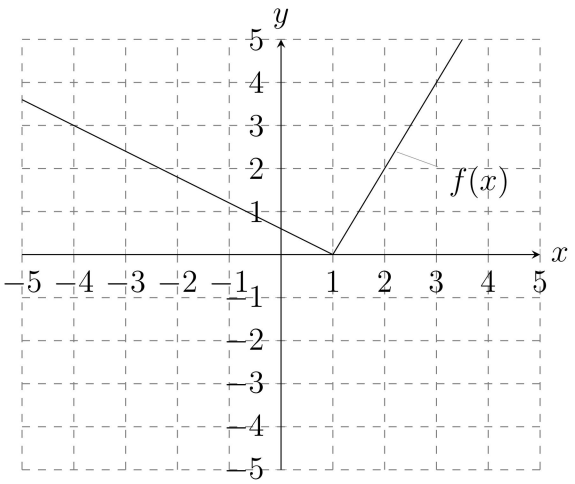
(a) If $H(x) = f(x)g(x)$, find $H'(1)$.

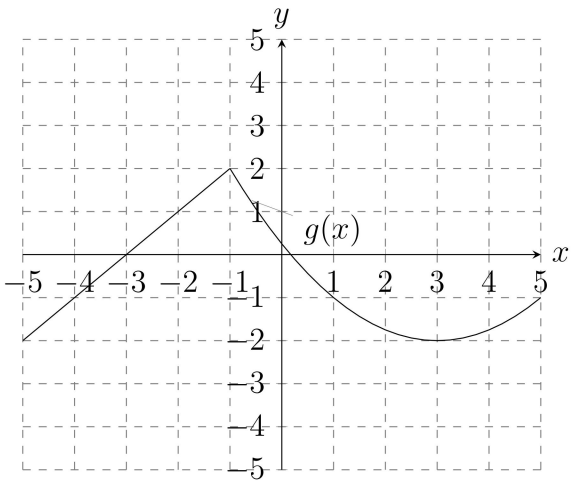
(b) If $L(x) = \dfrac{f(x)}{g(x)}$, find $L'(2)$.

(c) If $B(x) = \big[x + f(x)\big]g(x)$, find $B'(1)$.

(d) If $F(x) = \dfrac{g(x)}{f(x)}$, find $F'(3)$.

6. Consider the piecewise functions f and g whose graphs are shown below.





(a) If $P(x) = f(x)g(x)$, find $P'(-4)$.

(b) If $Q(x) = \dfrac{f(x)}{g(x)}$, find $Q'(3)$.

(c) If $C(x) = \dfrac{g(x)}{f(x)}$, find $C'(-1)$.

(d) If $N(x) = x^2 f(x)$, find $N'(2)$.