

Name: \_\_\_\_\_

Discussion Section: \_\_\_\_\_

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**Solutions should show all of your work, not just a single final answer.**

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## The Product and Quotient Rules

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1. Compute the derivative of each function below using the methods from Sections 3.1 and 3.2 (**not other methods**).

(a)  $f(x) = \frac{x}{x+3}$  (simplify numerator in final answer)

(b)  $f(x) = \frac{e^x}{1+e^x}$  (simplify numerator in final answer)

(c)  $f(x) = \sqrt{x}e^x$

(d)  $f(x) = \frac{e^x}{x^n}$  for constant  $n$ , in two ways: (i) quotient rule and (ii) product rule

(e)  $f(x) = \frac{1}{x} + \frac{1}{1-x}$  (in final answer, use a common denominator and simplify numerator)

2. In the function  $h(x)$  below, defined in terms of  $f(x)$  and  $g(x)$ , determine  $h'(2)$  in each case if  $f(2) = 3$ ,  $g(2) = 4$ ,  $f'(2) = 1$ , and  $g'(2) = -5$ .

(a)  $h(x) = 2f(x) + 5g(x)$

(b)  $h(x) = f(x)g(x)$

(c)  $h(x) = \frac{f(x)}{g(x)}$

(d)  $h(x) = \frac{g(x)}{f(x) + 2}$