

Name: _____

Notesheet. Section 5.4: Differentiation of exponential functions

Math 1210

Challenge 1. Recall the definition of e (what happens when you take the derivative of e^x ?). Using this fact, find the derivatives of the following functions.

(a) $f(x) = xe^x$

(b) $g(k) = \sqrt{3 + e^k}$

Challenge 2. Of course differentiation rules that apply to functions in general can be applied to exponential functions too! Please differentiate the following functions, applying the chain rule as needed.

(a) $f(t) = e^{2t}$

(b) $h(x) = e^{\ell(x)}$ (here ℓ is an arbitrary function).

Challenge 3. MOAR derivatives of exponents!!!

(a) If $y = e^{3t^2+1}$, find $\frac{dy}{dt}$

Challenge 4. The equation to calculate continuous compounded interest is $A = Pe^{rt}$ (you can think of A as a function of t), where t is the number of years, P is the principal (amount of money you started with), r is the annual interest rate, and A is the accumulated amount of money at the end of t years.

What is $\frac{dA}{dt}$? What does the variable $\frac{dA}{dt}$ represent in the context of the above?

Challenge 5. Let b be a positive constant. What is the derivative of b^x ? (Hint: Rewrite b^x in a clever way involving the functions e^x and $\log_e(x)$, then differentiate.)