CALCULUS II	REVIEW TEST 2	SPRING 2018
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1. **Derive** the exponential growth (decay) law starting with $dy/dt \alpha y$ (proportional to) and using the assumption that $y(0) = y_0$.

2. **Derive** the derivative of the function $y = e^x$.

3. **Derive** the derivative of $y = sin^{-1}x$ using the rule dy/dx = 1/(dx/dy).

- 4. Graph *y* = *cosh x* **and** *y* = *sinh x* below on the same axis
 - a. Show the sign chart for the first and second derivatives of each function
 - b. Show the point *y*(0) on each graph

- 5. Starting with either the function $y = tan h^{-1} x$ or the function $cos h^{-1} x$ (*choose one*)
 - a. Use algebra to find the logarithmic form of the function
 - b. Find the derivative of this logarithmic form
 - c. Write the corresponding integral form of the original function

- 6. For the function $f(x) = 8 3x^2, x \ge 0$
 - a. Find $f^{-1}(x)$
 - b. Sketch the graph of f(x) and $f^{-1}(x)$
 - c. State the domain and range of the function and its inverse.

7. State the **integral definition** of $y = \ln x$; and **show graphically** why it makes sense.

- a. State the Fundamental Theorem of Calculus (this shows how to differentiate an integral).
- b. Apply the above theorem to differentiate $y = \ln x$.

8.

a. Find f'(x) for $f(x) = 3^{x^3} + \sqrt{e^{2x}}$

b. Find
$$f'(x)$$
 for $f(x) = (2x^3 + 3x)^{5x-x^3}$.

9.

a. Find f'(x) for $f(x) = ln(x^2 + x^3 + 5)$

b. Find
$$f'(x)$$
 for $y = \frac{(x^3 + x^2 - 5)\sqrt{x - 1/x}}{(x^2 + 3)^2 (x + 5)^3 (9x - 7)^4}$

10. The Thulium isotope ¹⁶⁸ Tm has a half-life of approximately 93 days. If a sample weighs 10 milligrams initially, how much remains after t days? Estimate, but do not calculate, how much will be left after 100 days?