

1. Differentiate the following

$$y = \frac{xe^x}{3x-1} \quad y = x \ln(x) - 1 \quad y = e^{3x} \ln(\sqrt{4x+2})$$

2. Use the properties of logs to simplify and then find the derivative. $y = \ln\left(\frac{e^x \sqrt{x}(x-2)^4}{(4x+1)^6}\right)$
3. Find the equation of the tangent line to the graph of $y = \frac{e^x}{1+e^x}$ at $(0,0.5)$.
4. A population of Armadillos in a small Texas city was 10,000 when first counted in 1900. The population is growing exponentially with a growth constant of 0.05.
- (a) Write an equation, $P(t)$, which gives the population at t years after 1900.
- (b) In what year did the population double its size?
- (c) At what rate is the population growing when there are 25,000 Armadillos?
5. The half-life of cobalt-60 is 5.3 years. Find the decay constant, then determine how long until only 30% of a sample of cobalt-60 remains.
6. How much money must you invest at 4.5% interest compounded continuously in order to have \$10,000 at the end of 5 years?
7. A farm purchased in 1985 for 1 million dollars was valued at 3 million dollars in 1995. If the farm continues to appreciate at the same rate (with continuous compounding), when will it be worth ten million dollars?

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4. A population of Armadillos in a small Texas city was 10,000 when first counted in 1900. The population is growing exponentially with a growth constant equal of .05.
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