Week-In-Review #11

1. \$500 is deposited into an account that earns interest at 7.5% compounded continuously. How much will the account be worth in 10 years?

2. How much should be deposited into an account paying 5.2% compounded continuously, in order to have accumulated \$10,000 in 15 years?

3. How long will it take for an account compounded continuously at 6% to quadruple?

4. At what interest rate will \$8000 grow to \$12,000 over 11 years, if the account is compounded continuously?

5. Find $f[g(x)]$ and $g[f(t)]$, given the following:

   (a) $f(t) = t^2 + 2t; \qquad g(x) = x + 5$

   (b) $f(t) = e^t + 7; \qquad g(x) = x^2$

6. Find derivatives of the following:

   (a) $f(x) = x^3 - 6x + e^x + ex + e^2$

   (b) $g(x) = e^{\sqrt{x}+10x^2-6}$

   (c) $h(x) = e^{\sqrt[3]{x^3-14x^2}}$

   (d) $r(x) = 2e^{\frac{1}{x}-7x^5}$

   (e) $k(x) = 7xe^{x^8+1}$

   (f) $y = 3x^2 e^{(x^2+3)^4(x+6)^{10}}$

   (g) $m(x) = \dfrac{e^x + e^{-x}}{3x^4 + 8}$

(h) $g(x) = 2^x + x^2$

(i) $n(x) = 3^{-x+6\sqrt{x}} + e^{2x} + 7$

(j) $y = 4x^6 - 8x^{-2} + \ln x - \ln 3$

(k) $f(x) = \ln\left(x^2 + 4x^6\right)^3$

(l) $y = \ln\left(\dfrac{3x^4 + 9}{\sqrt{x} + 17}\right)$

(m) $f(x) = \log_5(3x^5 - 4x^2 + 3) + \log_6 2$

(n) $g(x) = 4\log_2(x^3 + 9x^7)$

(o) $h(x) = \left(\log_7 x^2\right)^3$

(p) $y = \log_3(\ln(\log_4 x^2))$

7. Find the equation of the tangent line to $y = \ln x + e^x$ at $x = 1$.

8. Using calculus, find the pertinent information and graph $y = e^x - e^{-x}$.

9. Using calculus, find the pertinent information and graph $y = \dfrac{\ln x}{x}$.

10. Find $\frac{dy}{du}$, $\frac{du}{dx}$, and $\frac{dy}{dx}$, expressing $\frac{dy}{dx}$ in terms of x.

(a) $y = u^{10}$; $\quad u = \sqrt[3]{x} - \frac{1}{x}$

(b) $y = e^u$; $\quad u = \sqrt{x} + x^7$

(c) $y = \ln u$; $\quad u = x^2 + 9$

11. Given $f(x) = 25x + e^{-x}$, find
    (a) the relative rate of change of $f(x)$.
    (b) the percentage rate of change of $f(x)$.

12. If the price-demand equation for a product is given to be $x = 5(p - 60)^2$, determine whether the demand is elastic, inelastic, or has unit elasticity at the indicated prices:
    (a) $p = \$10$
    (b) $p = \$20$
    (c) $p = \$25$

13. Given demand for a product is $x = (225 - 5p)^{1/2}$,

(a) Classify the type of elasticity at the current price of \$10.

(b) If the price changes by 10%, what is the approximate change in demand?

(c) Should the price be raised or lowered from the current price in order to increase revenue?

(d) What price maximizes revenue?