Calculators are NOT permitted.
In problems 1–5, find the indicated general antiderivative. (5 points each)

1. $\int \left(8.6e^{-1.2x} - \frac{3}{10}\right) \, dx$

   $= 8.6e^{-1.2x} - \frac{3}{10}x + C$

2. $\int \left(\frac{8}{5x^3} + 6\sqrt{x}\right) \, dx$

   $= \int \frac{8}{5}x^{-3} + 6x^{\frac{1}{2}} \, dx = \left(\frac{8}{5}\right)\frac{x^{-2}}{-2} + 6\frac{x^{\frac{3}{2}}}{\frac{3}{2}} + C$

3. $\int \frac{d}{dx} \left(\ln(5x^2 + 3)\right) \, dx$

   $= \ln(5x^2 + 3) + C$

4. $\int \left(10e^x - 32x^7\right) \, dx$

   $= 10e^x - \frac{32}{8}x^8 + C$

5. $\int \left(\frac{3.5}{2x} - \frac{7^x}{3}\right) \, dx$

   $= \frac{3.5}{2} \ln|x| - \frac{7^x}{3 \ln 7} + C$
6. (5 points) Compute \( \frac{d}{dx} \left( \int \frac{x^7 + xe^x}{\ln(x^4 + \sqrt{x})} \, dx \right) \)

\[ \frac{x^7 + xe^x}{\ln(x^4 + \sqrt{x})} \]

7. (10 Points) Find \( F \), the specific antiderivative of the function \( f \), when \( f(x) = 4x^3 - 6x^{-2} \), and \( F(2) = 10 \).

\[ F(x) = \int f(x) \, dx = x^4 + 6x^{-1} + C \]

\[ F(2) = 2^4 + \frac{6}{2} + C = 10 \]

\[ 19 + C = 10 \]

\[ C = -9 \]

\[ F(x) = x^4 + 6x^{-1} - 9 \]

8. (10 points) The rate of change of books purchased by Snell Library can be modeled by the function:

\[ r(t) = 0.125t^2 - 1.5t + 3 \]

hundred books per year, \( t \) years after 1990. Find a model for \( B(t) \), the number of books purchased by Snell Library \( t \) years after 1990. Use the fact that 1000 books were purchased in 1990. Give units.

\[ B(t) = \int r(t) \, dt = \frac{0.125t^3}{3} - \frac{1.5t^2}{2} + 3t + C \]

\[ B(0) = 1000 \]

\[ C = 1000 \]

\[ B(t) = \frac{0.125t^3}{3} - \frac{1.5t^2}{2} + 3t + 1000 \]

hundred books
MATH 1231 Quiz 7 (50pts)  
Fall 2014  
Name: ____________________________

Calculators are NOT permitted.
In problems 1-5, find the indicated general antiderivative. (5 points each)

1. \[ \int \left( 8.4e^{-1.3x} - \frac{7}{10} \right) \, dx \]
   
   \[ = 8.4 \frac{e^{-1.3x}}{-1.3} - \frac{7x}{10} + C \]

2. \[ \int \left( \frac{6}{5x^3} + 5\sqrt{x} \right) \, dx \]
   
   \[ = \int \frac{6}{5x^3} + 5x^{\frac{1}{2}} \, dx = \frac{6(x^2)}{5} + \frac{5x^{\frac{3}{2}}}{\frac{3}{2}} + C \]

3. \[ \int \frac{d}{dx}(\ln(7x^3+4)) \, dx \]
   
   \[ = \ln(7x^3+4) + C \]

4. \[ \int (12e^x - 42xe^6) \, dx \]
   
   \[ = 12e^x - \frac{42x^7}{7} + C \]

5. \[ \int \left( \frac{3.7}{2x} - \frac{5^x}{6} \right) \, dx \]
   
   \[ = \frac{3.7}{2} \ln|x| - \frac{5^x}{6\ln5} + C \]
6. (5 points) Compute \( \frac{d}{dx} \left( \int \frac{x^5 + xe^x}{\ln(x^3 + \sqrt{x})} \, dx \right) \)

\[ = \frac{x^5 + xe^x}{\ln(x^3 + \sqrt{x})} \]

7. (10 Points) Find \( F \), the specific antiderivative of the function \( f \), when \( f(x) = 4x^3 - 6x^{-2} \), and \( F(2) = 11 \).

\[ F(x) = \int f(x) \, dx = 4x^4 + 6x^{-1} + C \]

\[ F(2) = 2^4 + \frac{6}{2} + C = 11 \]

\[ 19 + C = 11 \]

\[ C = -8 \]

8. (10 points) The rate of change of books purchased by Snell Library can be modeled by the function:

\[ r(t) = 0.125t^2 - 1.5t + 2 \]

hundred books per year, \( t \) years after 1980. Find a model for \( B(t) \), the number of books purchased by Snell Library \( t \) years after 1980. Use the fact that 900 books were purchased in 1980. Give units.

\[ B(t) = \int r(t) \, dt = \frac{0.125t^3}{3} - \frac{1.5t^2}{2} + 2t + C \]

\[ B(0) = C = 9 \]  

\[ B(t) = \frac{0.125t^3}{3} - \frac{1.5t^2}{2} + 2t + 9 \]  

hundred books