1. Find the derivative of the function: \( m(t) = -6t(5t^4 - 1)^2 \) (2 points)

2. An oil well off the Gulf Coast is leaking, with the leak spreading oil over the surface as a circle. At any time \( t \) (in minutes) after the beginning of the leak, the radius of the circular oil slick on the surface is \( r(t) = t^2 \) feet. Let \( A(r) = \pi r^2 \) represent the area of a circle of radius \( r \).
   a) Find and interpret \( A[r(t)] \). (3 points)
   b) Find \( D_t (A[r(t)]) \) when \( t=100 \). (2 points)

3. Find the derivative of the function: \( y = x^2e^{-2x} \) (3 points)
SOLUTIONS OF QUIZ 4

1. \( m(t) = -6t(5t^4 - 1)^2 \Rightarrow m'(t) = (-6t)'(5t^4 - 1)^2 + (-6t)((5t^4 - 1)^2)' = -6(5t^4 - 1)^2 - 12t(5t^4 - 1)(5t^4 - 1)' = -6(5t^4 - 1)^2 - 240t^4(5t^4 - 1) = -6(5t^4 - 1)(5t^4 - 1 - 40t^4) = -6(5t^4 - 1)(45t^4 - 1) \)

2. a) \( A[r(t)] = \pi[r(t)]^2 = \pi(t^2)^2 = \pi t^4 \)
   This function represents the area of the oil slick as a function of time \( t \) after the beginning of the leak.
   b) \( A'[r(t)] = (\pi t^4)' = 4\pi t^3. \)
   So when \( t=100 \), \( A'[r(100)] = 4\pi \cdot 100^3 = 4000000\pi \)

3. \( y = x^2 e^{-2x} \Rightarrow y' = 2xe^{-2x} + x^2(-2)e^{-2x} = 2xe^{-2x}(1 - x) \)