1. Find the first two derivatives of \( f(x) = \sec(x) \).
   Correct Answers:
   \begin{itemize}
   \item \( f'(x) = \sec(x) \tan(x) \)
   \item \( f''(x) = \sec(x) \tan^2(x) + \sec^3(x) \)
   \end{itemize}

2. Differentiate the function \( f(t) = e^{\sin(3t)} \)
   Correct Answer:
   \( f'(t) = 3e^{\sin(3t)} \cos(3t) \)

3. Differentiate the function \( f(x) = \tan^{-1} \left( \frac{1-x}{1+x} \right) \)
   Correct Answer:
   \( f'(x) = -\frac{1}{1+x^2} \)

4. Use logarithmic differentiation to find \( \frac{dy}{dx} \) where
   \[ y = \frac{(1+2x)^{3/2}}{(1+3x)^{4/3}} \]
   Correct Answer:
   \[ f'(x) = \frac{(3 \sqrt{1+2x})}{4 \sqrt[3]{1+3x}} \left( \frac{3}{1+2x} - \frac{4}{1+3x} \right) \]

5. The equation of the tangent line to \( y = \frac{5}{x^2} - \frac{2}{x^3} \) at \((-1,7)\) can be written as \( y = mx + b \) where
   \( m = \) \underline{16} and \( b = \) \underline{23}
   Correct Answers:
   \begin{itemize}
   \item \( m = 16 \)
   \item \( b = 23 \)
   \end{itemize}

6. A foul tip of a baseball is hit straight upward from a height of 4 feet with an initial velocity of 32 feet per second. The function \( s(t) = -16t^2 + 32t + 4 \) describes the ball’s height above the ground in feet, \( t \) seconds after it was hit. What is the instantaneous velocity of the ball \( t = 1.1 \) seconds after it was hit? What is the maximum height of the ball?
   Correct Answer: \( -3.2 \) feet/sec. \( \bullet \) 20 feet.

7. Find the derivative of \( f(x) = \tan(x^6) \).
   Correct Answers:
   \begin{itemize}
   \item \( f'(x) = 6x^5 \sec^2(x^6) \)
   \end{itemize}

8. Find the derivative \( f(x) = (5 - 3x^2)^{-3} \).
   Correct Answers:
   \[ f'(x) = \frac{18x}{(3x^2-5)^4} \]

9. Given \( xy + y^2 + x^3 = 7 \), find \( \frac{dy}{dx} \) by using implicit differentiation.
   Correct Answers:
   \[ \frac{dy}{dx} = -\frac{3x^2 + y}{x + 2y} \]

10. Use implicit differentiation to find the equation (in \( y = mx + b \) form) of the tangent line to the curve \( 2x^2 + xy - y^2 = 2at (1,1) \).
    Correct Answers: \( m = 5 \) \quad \( b = -4 \)

11. A telephone pole is 15 ft away from a street light; the latter is 20 ft above the ground. A squirrel runs up the telephone pole at 8 ft/s. How fast is the squirrel’s shadow traveling along the (level) ground when the squirrel is 18 ft above the ground?
    Correct Answer: 600 ft/sec.

12. Determine two positive real numbers with product 2 in order to minimize the sum of their squares.
    Correct Answer: \( x = \sqrt{2}, \ y = \sqrt{2} \)

13. The function \( f(x) = 2x^3 - 30x^2 + 144x + 3 \) has one local minimum and one local maximum.
    This function has a local minimum at \( x \) equals \underline{6} with value \underline{219} and a local maximum at \( x \) equals \underline{4} with value \underline{227}.
    Correct Answers:
    This function has a local minimum at \( x \) equals 6 with value 219 and a local maximum at \( x \) equals 4 with value 227.

14. Consider the function \( f(x) = 2x^2 - 8x + 3 \). \( 0 \leq x \leq 7 \). The absolute maximum of \( f(x) \) (on the given interval) is \underline{8} and the absolute minimum of \( f(x) \) (on the given interval) is \underline{-5}.
    Correct Answers:
    The absolute maximum of \( f(x) \) (on the given interval) is 8 and the absolute minimum of \( f(x) \) (on the given interval) is -5.