Honors Calculus Quiz 9 12/2/5

Name: ___________________________ Signature: ___________________________

Show your work.

Question 1
Find the centroid of the region \( \mathcal{R} \) bounded by the curves \( 10y - y^2 + 2 = x \) and \( 2y^2 - 20y + 50 = x \). Also determine the volumes of revolution of the region \( \mathcal{R} \) about the coordinate axes.

Question 2
Discuss the convergence of the following series and see if you can find a formula for the sum explicitly when the series converges.

\[
\begin{align*}
\text{1.} & \quad \sum_{n=1}^{\infty} \frac{1}{n(n+2)} \\
\text{2.} & \quad \sum_{n=1}^{\infty} \frac{n4^n}{3^{2n}} \\
\text{3.} & \quad \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{4^n(2n+1)!} \\
\text{4.} & \quad \sum_{n=0}^{\infty} \frac{(n+1)x^n}{2^n}
\end{align*}
\]

Question 3
Solve each of the following differential equations and discuss the behavior of each solution:

\[
\begin{align*}
\text{1.} & \quad \frac{dy}{dt} + 3y = 2 \cos(2t), \quad y(0) = 4 \\
\text{2.} & \quad \frac{dy}{dt} = \frac{y^3}{ty + 2t}, \quad y(1) = 2
\end{align*}
\]