Name: _____

1. **[2 points]** Express $\cos(3t) - \cos(5t)$ as the product of two trigonometric functions.

2. **[3 points]** An undamped spring/mass system is modeled by $u'' + 9u = \sin(3t)$ with $u(0) = 0$ and $u'(0) = 0$. Determine $u(t)$. What happens to the system in the limit as t grows?

3. A 10 kg mass stretches a spring by 8 cm. The system is contained in a viscous medium which imparts a damping force of 2 N when the mass moves at 10cm/s. A motor imparts an external force of $4\cos(8t)$.

   (a) **[3 points]** Find the forced response $U(t)$ with U in m and t in s. Approximate coefficients to 7 decimal places.

   (b) **[1 point]** Express the forced response $U(t)$ in the form $R\cos(\omega t - \delta)$. Approximate R to 5 decimal places and δ to 3.

   (c) **[1 point]** Compare the amplitude of the forced response to the displacement when a constant force of 4 N is applied. Which is larger?