Think of an object attached to a spring and undergoing damped harmonic motion. The differential equation describing its motion is given by

$$\frac{d^2x}{dt^2} = -2\gamma\frac{dx}{dt} - \omega_0^2 x$$

where we have defined constants $\gamma = c/2m$ and $\omega_0^2 = k/m$, k being the spring constant, m being the mass of the object, and c being the damping constant for $F_{\text{ait}} = -cv$. On the back page, there is a large graph of its motion.

1. Is the motion *underdamped*, *overdamped*, or *critically damped*? Circle one. Explain your reasoning.

2. Mark up the diagram as follows:

   a. With a box, indicate all locations that are *turning points*.

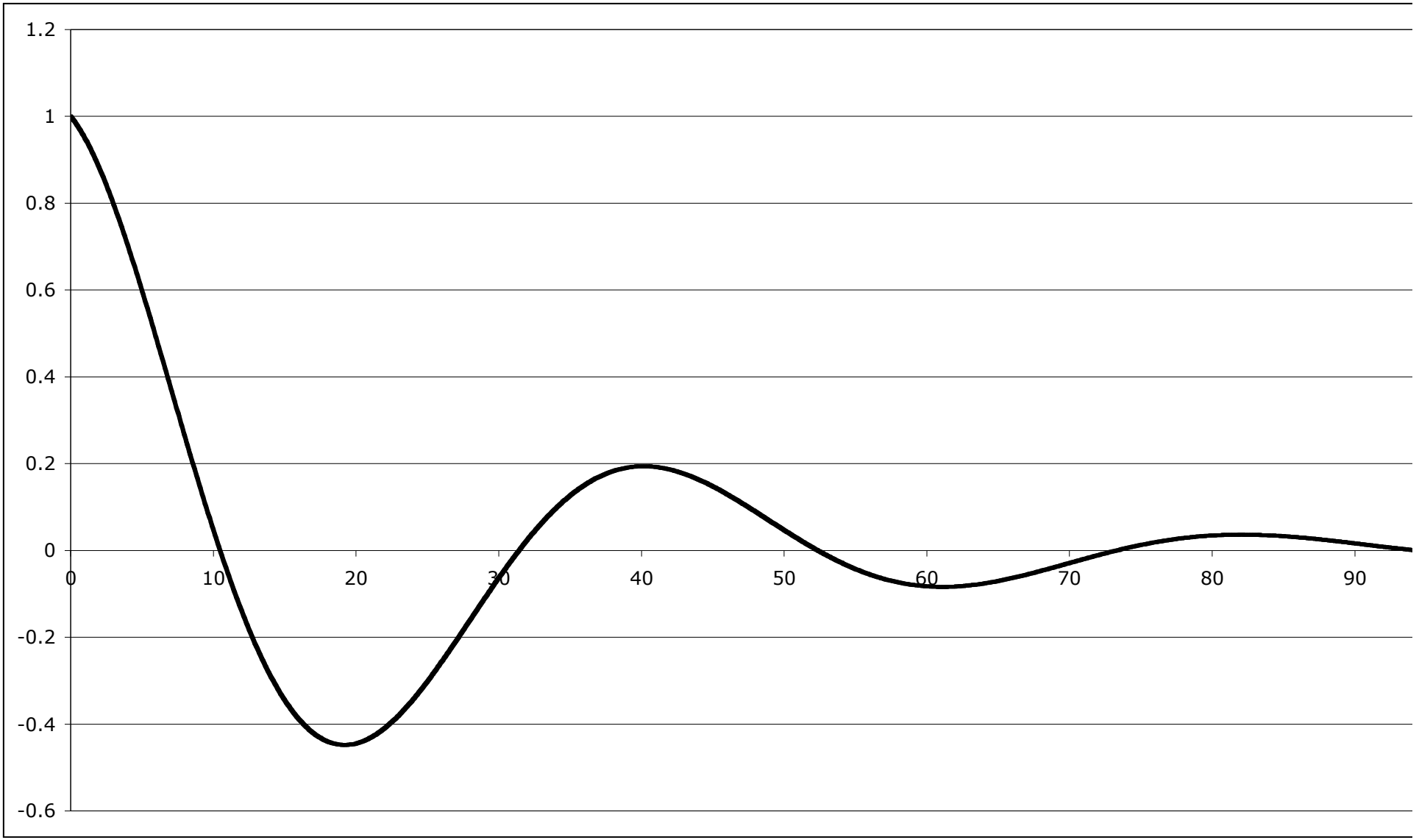
   b. With a circle, indicate all locations that are *inflection points.*

   c. With a triangle, indicate all locations that are *axis crossing points*.

3. For the *first* inflection point (as you move from left to right), draw a free body diagram, correctly indicating the magnitude and direction of all forces acting on the object. Explain your answer.

4. For the *second* turning point (as you move from left to right), draw a free body diagram, correctly indicating the magnitude and direction of all forces acting on the object. Explain your answer.

5. For the *second* axis-crossing point (as you move from left to right), draw a free body diagram, correctly indicating the magnitude and direction of all forces acting on the object. Explain your answer.


1.2
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