MA 226 Quiz 6 – B

Please show your work.

1. (5 pts) Consider the two systems of differential equations

   (i) \[
   \begin{align*}
   \frac{dx}{dt} &= 0.3x - 3xy \\
   \frac{dy}{dt} &= -2y + 0.1xy 
   \end{align*}
   \]

   (ii) \[
   \begin{align*}
   \frac{dx}{dt} &= 0.3x - 0.1xy \\
   \frac{dy}{dt} &= -0.1y + 2xy 
   \end{align*}
   \]

One of these systems refers to a predator-prey system with very lethargic predators – those who seldom catch prey but who can live for a long time on a single prey (for example, boa constrictors). The other system refers to a very active predator that requires many prey to stay healthy (such as a small cat). The prey in each case is the same. Identify which system is which and justify your answer.
2. (5 pts) A harmonic oscillator equation for \( y(t) \) is given as

\[
\frac{d^2 y}{dt^2} + 6 \frac{dy}{dt} + 7y = 0
\]

Using the guess and check method find two nonzero solutions that are not multiples of one another.