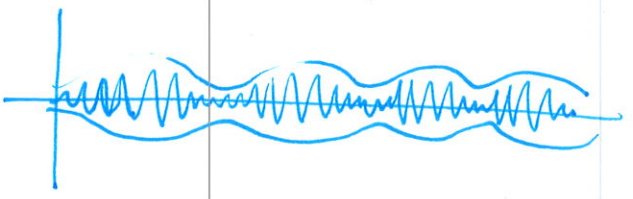
MAT 212, Quiz #11, Summer 2016 Name KEY

Instructions: Show all work. Answers without work required to obtain the solution will not receive full credit. Some questions may contain multiple parts: be sure to answer all of them. Give exact answers unless specifically asked to estimate.

1. Under what conditions do beats occur? Sketch a graph of a beat phenomenon.

Beats occur in an undamped system where the forcing frequency is similar but not identical to the natural frequency (and is periodic).



2. If $y(t) = 3e^{-t}\cos 2t - 2e^{-t}\sin 2t + \cos 3t$ for a forced spring system, determine:

i. The transient solution

$3e^{-t}\cos 2t - 2e^{-t}\sin 2t$

ii. The steady-state solution

$\cos 3t$

iii. Does the system experience beats or resonance? Why or why not?

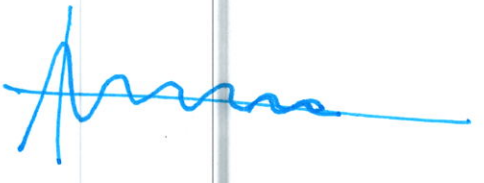
Neither; The system is damped.

iv. What is the natural frequency/quasi-frequency?

quasi-frequency (of transient system) is $2 - i$

v. Sketch the graph. How many times does it cross equilibrium?

infinitely many times



3. Find the inverse of $\begin{bmatrix} 3 & -1 \\ 4 & 2 \end{bmatrix}$. $= A$

$$A^{-1} = \frac{1}{\det A} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

$$= \frac{1}{6+4} \begin{bmatrix} 2 & 1 \\ -4 & 3 \end{bmatrix} = \frac{1}{10} \begin{bmatrix} 2 & 1 \\ -4 & 3 \end{bmatrix}$$

$$\text{or } \begin{bmatrix} 1/5 & 1/10 \\ -2/5 & 3/10 \end{bmatrix}$$