

MATH2214 - Quiz 5 - Fall 03 - Konaté

Note: This quiz requires the constant use of your graphing calculator and a computer. All pictures to be done by computer

Problem A (40 points)

Consider the first order initial value problem:

$$y' + 2y = 3 \cos(t); y(0) = 0 \quad (1)$$

- 1- Find the solution $y(t)$ of equation (1) using the method of undetermined coefficients;
- 2- Find the solution $y_e(t)$ of equation (1) using the Euler method with $h = 0.01 = \frac{1}{100}$ over the interval $[0, 10]$;
- 3- Use Matlab to plot $y(t)$ and $y_e(t)$ over the interval $[0, 10]$.

Problem B (60 points)

Consider the following second order initial value problems

- (1) $u'' + u = 0; \quad u(0) = 1; u'(0) = 3$
- (2) $u'' + \frac{1}{5}u' + u = 0; \quad u(0) = 1; u'(0) = 3$
- (3) $u'' + \frac{1}{5}u' + u = \sqrt{2} \cos(2t); \quad u(0) = 1; u'(0) = 3$
- (4) $u'' + \frac{1}{5}u' + u = -2 \sin(\sqrt{19}t); \quad u(0) = 1; u'(0) = 3$

1- write the solution of the homogerneous problems in the form

$u(t) = R \cos(\mu t - \delta) = R \cos(\Phi(t)); \quad \Phi(t) = \mu t - \delta$ and the non homoge-
neous problems in the form

$$u(t) = R \cos(\mu t - \delta) + u_p(t) = R \cos(\Phi(t)) + u_p(t); \quad \Phi(t) = \mu t - \delta$$

(Use your graphing calculator to find δ ;))

2 Use the answer to the precedent equestion to determine t such that
 $\Phi(t) = \frac{\pi}{2}; \pi; \frac{3\pi}{2}$

3- plot in a same picture the solution of both four equations on the interval
 $[0, 10]$;

4- what can you say on the behavior of each solution when $t \rightarrow +\infty$.