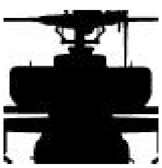
OKLAHOMA STATE UNIVERSITY

SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING



ECEN 3413 Controls I
Spring 1998
Midterm Exam #1

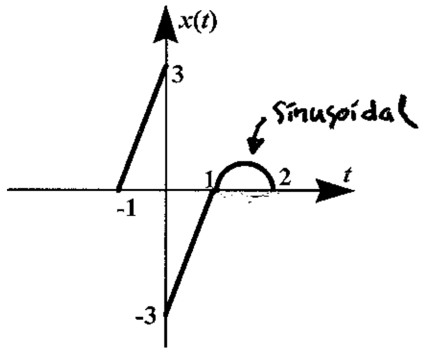
Name : ______________________________

Student ID: ________________________________

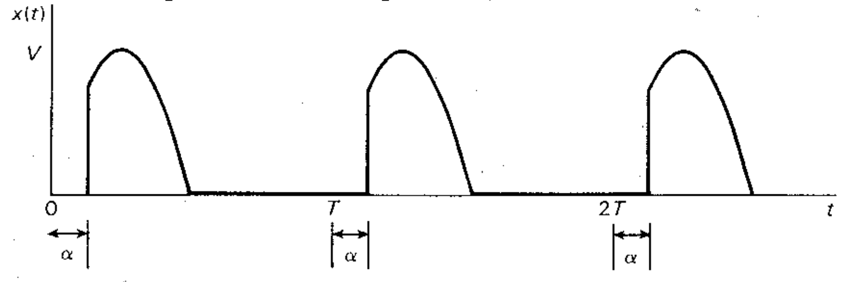
E-Mail Address:_______________________________________

Problem 1: (*Signal Representation*)

Describe the following signal, $x(t)$, in terms of some basis functions:



<u>Problem 2</u>: (*Laplace transform*)
Determine the Laplace transform of the following signal, $x(t)$, with only *ten* periods (cycles). (Note that the maximum amplitude is V with period T)



<u>Problem 3</u>: (*Solving Differential Equation*)

Solving the linear time-invariant ordinary differential equation

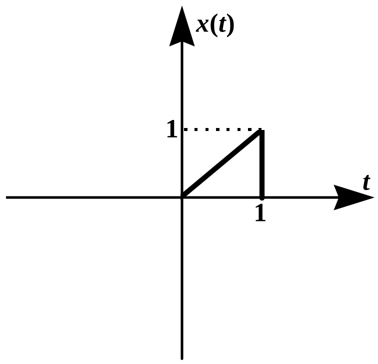
$$\frac{d^2 y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 13y(t) = -5\frac{dx(t)}{dt} + 6x(t),$$

with initial conditions and input $y(0) = 3$, $\left.\frac{dy(t)}{dt}\right|_{t=0} = -2$, $x(t) = e^{-4t}u(t)$, where $y(t)$ is the output response and $x(t)$ is the input signal. Find $y(t)$ and $y(0)$ via initial value theorem.

Problem 4: (*Electrical Circuit*)

Consider a filtered circuit that the output response, $y(t)$, is the time-convolution of the input signal, $x(t)$, and the impulse response, $h(t)$, where $h(t) = e^{-2t}u(t)$ (i.e., $y(t) = \int_0^t x(\tau)h(t-\tau)d\tau$).

x(t) is graphically given as



Determine $y(t)$.