

**EECS 120, Spring/1999
Midterm #1**

For your answers, you only need to express the results in rational form, i.e. $\tan^{-1}()$, $\sin()$, \sqrt{e} , $\pi/7$, etc. There is no need to evaluate numerical values.

Problem 1 (9 points, 3 each)

Are these functions periodic? If so, what is the period?

- a. $\sin t + \sin 2t$
- b. $\sin 5t + \cos(7t + \pi/4)$
- c. $\sin 5t + \cos 7(\pi)t$

Problem 2 (15 points, 3 each)

Determine whether each is a power signal, energy signal or neither. Also calculate the power or energy for each.

- a. $\sin(t)\cos(t)$
- b. $\text{summation}(\text{from } n = -\infty \text{ to } +\infty)[\text{PI}((t-3*n)/4)]$
- c. $\text{summation}(\text{from } n = -\infty \text{ to } +\infty)[\text{Sigma}(t-n)*\sin(\pi*t)]$
- d. $\text{square root} [\text{Sigma}(t-1/4)*\cos(\pi*t)]$
- e. $\text{PI}(t) * \text{PI}(t/2)$

Problem 3 (10 points)

$$y(t) = e^{-t} * u(t) * \text{summation}(\text{from } n = 0 \text{ to } \infty) [\text{Sigma} (t - n)]$$

Find the value of $y(0)$, $y(1)$, $y(2)$, and $y(\infty)$.

Problem 4 (13 points, 3/6/4)

$$x(t) = \sin^2(t) \text{ ---> } h_1(t) = e^{-t} * u(t) \text{ ---> } y(t)$$

- a. Find the Fourier series (complex exponentials) expansion of $x(t)$.
- b. Find the Fourier series expansion of $y(t)$.
- c. Sketch the 2-sided amplitude and phase spectrum of $x(t)$ and $y(t)$. Label salient features.

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**Posted by HKN (Electrical Engineering and Computer Science Honor Society)
University of California at Berkeley
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