Solutions to EECS 206 Exam 1, 2002-10-3

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1. $RMS(x) = \sqrt{\frac{1}{8}\int_{-2}^{6} x^2(t)\,\mathrm{d}t} = \sqrt{\frac{1}{8}(4 \cdot 2^2 + 2 \cdot 4^2)} = \sqrt{6}$ *(HW 1-1)*

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2. This is a sum of sinusoidal signals all of which have the same frequency $\omega_0 = 1$, so the fundamental period is $T_0 = 2\pi/\omega_0 = 2\pi$. *(HW 1-4a, 3-5a)*

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3. The fundamental periods of the sinusoids in $x(t)$ are 2 and $1/3$, which have least common multiple $T_0 = 2$, so the fundamental frequency of $y(t)$ is $f_0 = 1/T_0 = 1/2$. *(HW 2-2)*

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4. The fundamental period of $x(t)$ is 1. The fundamental period of $y(t)$ is half that of $x(t)$, so $T_y = 1/2$. Alternatively, by substitution we have $y(t) = 12\cos(4\pi t + \phi)$ so $T_y = 1/2$. *(HW 2-2)*

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5. $MS(ax - b) = a^2 MS(x) - 2abM(x) + b^2 = 3^2 \cdot 4 - 2 \cdot 3 \cdot 2 \cdot 2 + 2^2 = 16$ *(HW 2-6b)*

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6. $C(x, y) = \sum_n x[n]y[n] = x[0]y[0] = 1$ *(HW 2-5)*

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7. `sum(x.^2)` computes the energy. *(Lab 1)*

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8. Fig. (e) is $x(t)$ itself. Solving $2 - t/2 = 2$, the left endpoint of $x(t)$ ends up at $t = 0$. Solving $2 - t/2 = 8$, the right endpoint of $x(t)$ ends up at $t = -12$. So (a) is the correct answer for $y(t)$. *(HW 1-5)*

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9. $M(x) = 6$ and $M(y) = 5[M(x) - 1] = 25$. *(HW 1-3)*

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10. $3\mathrm{e}^{-\jmath\pi/2} + 2\mathrm{e}^{\jmath\pi/2} = \mathrm{e}^{-\jmath\pi/2}$, so $\phi = -\pi/2$. *(HW 3-2a)*
The answer $3\pi/2$ is also acceptable, although $-\pi/2$ is preferable since our convention has been to specify phases in the interval $(-\pi, -\pi]$ in this course. Including two possible answers in the choices was an accident, not intentional.

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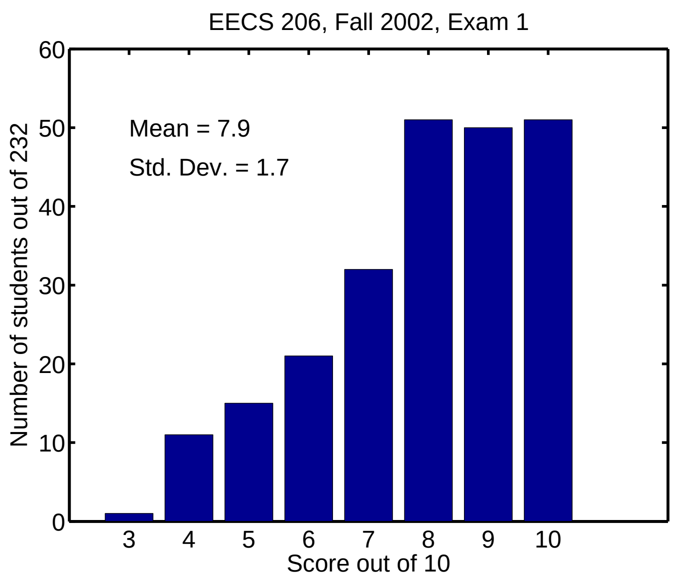
232 students, mean=7.9, std=1.7, hist[3:10] = [1 11 15 21 32 51 50 51]



For elaboration on these solutions, please come to office hours.