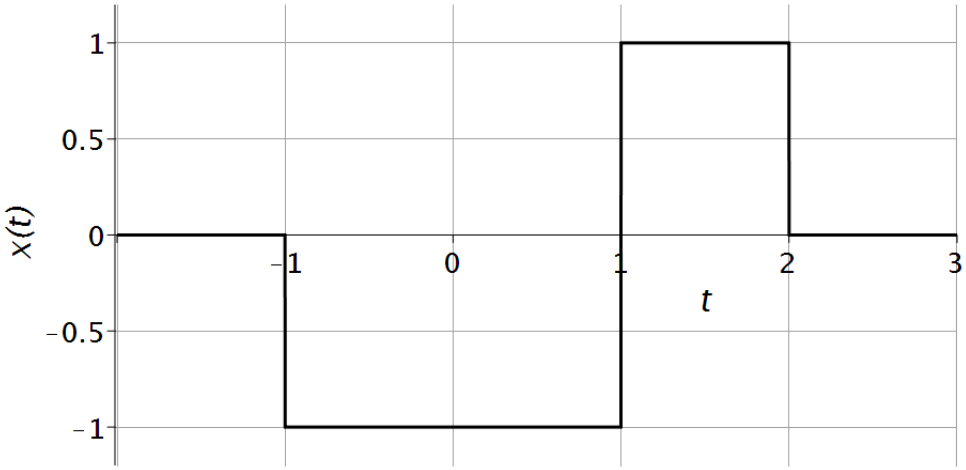
# Signal Processing (İÖ)- Midterm Make-Up Exam

Istanbul University - Computer Engineering Department - FALL 2016

December 15th, 2016

**PLEASE READ:** The duration for this exam is **60** minutes. Please answer the questions in ENGLISH briefly and clearly. **Bad handwriting, unclear statements, ambiguous answers will result in credit loss**. You may bring one calculator, an A4 sized paper which you can fill with anything you want, EXCEPT problems and solutions and a copy of Appendix A from the book to the exam. (If you do not have a filled A4-sized paper, please let the Proctor Assistant know). Every other material is forbidden. Sharing of materials is not allowed and will be considered cheating if done so. Please read the questions before solving them. Please RETURN your exam papers and your A4 papers at the end of the examination. This test has total of **100** points worth of questions. Anyone attempting to cheat, help someone else to cheat or make an effort to do these will receive 0 points for the exam and will be reported to the Dean's office. Good Luck. (Mustafa Dağtekin)

**Q1:** Consider the following CONTINUOUS TIME signals and answer the following questions.




(a) `(20 pts)` Please carefully sketch $x(2t-1)+x(\frac{t}{3}+1)$.

(b) `(10 pts)` Please determine whether $x(t)$ is an energy or power signal. Calculate its power or energy, whichever applies.

**Q2:** `(40 pts)` The systems that follow have input $x(t)$ or $x[n]$ and output $y(t)$ or $y[n]$. For each system, determine whether it is (i)`(3 pts each)` memoryless, (ii)`(3 pts each)` causal , (iii)`(4 pts each)` stable (Show your work) , (iv)`(5 pts each)` linear (Show your work), and (v) `(4 pts each)` time-invariant (Show your work).

**(a)** $$y[n]=\frac{x[n+1]}{n-1}\,u[n]$$

**(b)** $$y(t)=e^{x(t-1)}$$

**Q3:** `(20 pts)` Consider the following signal.

$$x(t)=\cos^2(2\pi t)+\sin^2(3\pi t)$$

(a) `(20 pts)` Is $x(t)$ periodic? If so, calculate its fundamental period, frequency and angular frequency.

(b) `(10 pts)` Please determine whether $x(t)$ is an even signal, odd signal or neither.