

Welcome to an SB3 Exam.

- The first rule of The Exam is: you do not talk about The Exam.
- The second rule of The Exam is: you DO NOT talk about The Exam!
- Third rule of The Exam: if the TA yells “stop”, goes limp, or taps out, the exam is over.
- Fourth rule: only one student to an exam.
- Fifth rule: one exam at a time.
- Sixth rule: the exams are bare brain. No shirts, shoes with answers, no notes, no books, no electronics, no phones, no calculators, no ipods, no mp3 players, no other cheating.
- Seventh rule: The exam will go on as long as the TA permits.
- And the eighth and final rule: if this is your first time seeing these rules, you have to get out more. Please have an empty seat to your left and right (until the room fills up). If you have a question, raise your hand; do not speak until a TA arrives. When finished, you may leave your seat to hand your exam to a TA. Do not leave your seat otherwise without permission of a TA. None of the questions is supposed to be a trick question or to take a long time. If you are stuck, please move on and come back. Write your name at the top right of every page, and check now that your exam is complete with all 1 pages. This is the equation page.

Definitions

- The real and imaginary parts of $z = x + iy$ are $\Re(z) = x$ and $\Im(z) = y$, with x and y pure real.
- The Laplace transform operator is \mathcal{L} , with

$$\mathcal{L}[f(t)] = \tilde{f}(s) = \int_0^{\infty} dt e^{-st} f(t).$$

- The inverse Laplace transform is \mathcal{L}^{-1} , with

$$\mathcal{L}^{-1}[\tilde{f}(s)] = \int_{-i\infty}^{i\infty} \frac{ds}{2\pi i} e^{st} \tilde{f}(s).$$

- The convolution operator \star is defined as

$$f \star g(t) = \int_0^{\infty} dt' f(t-t')g(t').$$