

UCSD ECE 35 Prerequisite Test

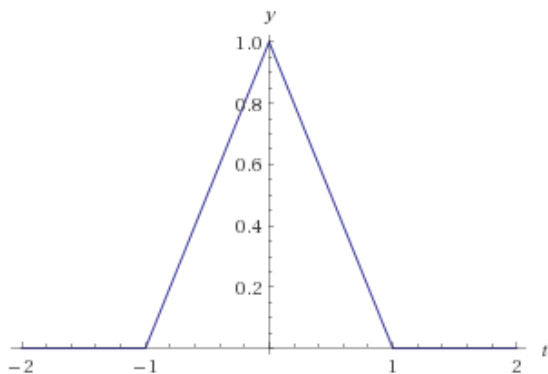
1. (MATH 20F) Write the following system of equations as a matrix equation of the form $Ax = b$. Use this matrix equation to find x_1 and x_2 .

$$\begin{aligned}x_1 + 4x_2 &= 2 \\4x_1 + 4x_2 &= 5\end{aligned}$$

2. (MATH 20F) Given the following system of equations, solve for x_1 , x_2 , and x_3 :

$$\begin{aligned}-3x_1 - 2x_2 + 7x_3 &= 5 \\3x_1 + 3x_2 - 4x_3 &= 7 \\4x_1 + 2x_2 + 6x_3 &= 20\end{aligned}$$

3. (MATH 20B) Suppose $y(t)$ is the function shown below. Find $\int_{-\infty}^{\infty} y(t) dt$.



4. (MATH 20B) Let $f(t) = at^2 + bt + c$.

(a) Find $\frac{df(t)}{dt}$

(b) Find $\int_{t_1}^{t_2} f(t) dt$.

5. (MATH 20B) Solve the following indefinite integrals:

(a) Suppose $I(t) = C \frac{dV(t)}{dt}$. Find $I(t)$ if $V(t) = \sin(\omega t)$.

(b) Suppose $V(t) = L \frac{dI(t)}{dt}$. Find $I(t)$ if $V(t) = \cos(\omega t)$.

6. (MATH 20B) Rewrite the following complex numbers given in rectangular coordinates in polar coordinates:

- (a) $4 + 4j$
- (b) 3
- (c) $-2j$
- (d) $-12 + 3j$

7. (MATH 20B) Simplify the following complex expressions. Write your answer in phasor notation.

- (a) $(4 + 3j) - (2 - 6j)$
- (b) $(1 + 2j)(4 + 6j)$
- (c) $(1 + 2j)(4 - 6j)$
- (d) $\frac{(2 + 4j)}{(6 - 7j)}$
- (e) $\frac{(1 + 2j) + (3 + 4j)}{(2 - 3j) - 4}$
- (f) $[(1 + 2j)(2 + 3j)]^*$ where * denotes the complex conjugate

8. (MATH 20B) Evaluate the following integrals:

- (a) $\int \cos(t) dt$
- (b) $\int_0^t \cos(t) dt$
- (c) $\int \frac{5}{x} dx$
- (d) $\int e^x dx$
- (e) $\int e^{jx} dx$
- (f) $\int_{-\infty}^t x(\tau) e^{j\tau} d\tau$ where $x(\tau) = \begin{cases} 1 & -3 < \tau < 3 \\ 0 & \text{else} \end{cases}$
- (g) $\int_0^y x e^{-x^2} dx$
- (h) $\int_{-\frac{y}{2}}^{\frac{y}{2}} (2x + 4) dx$