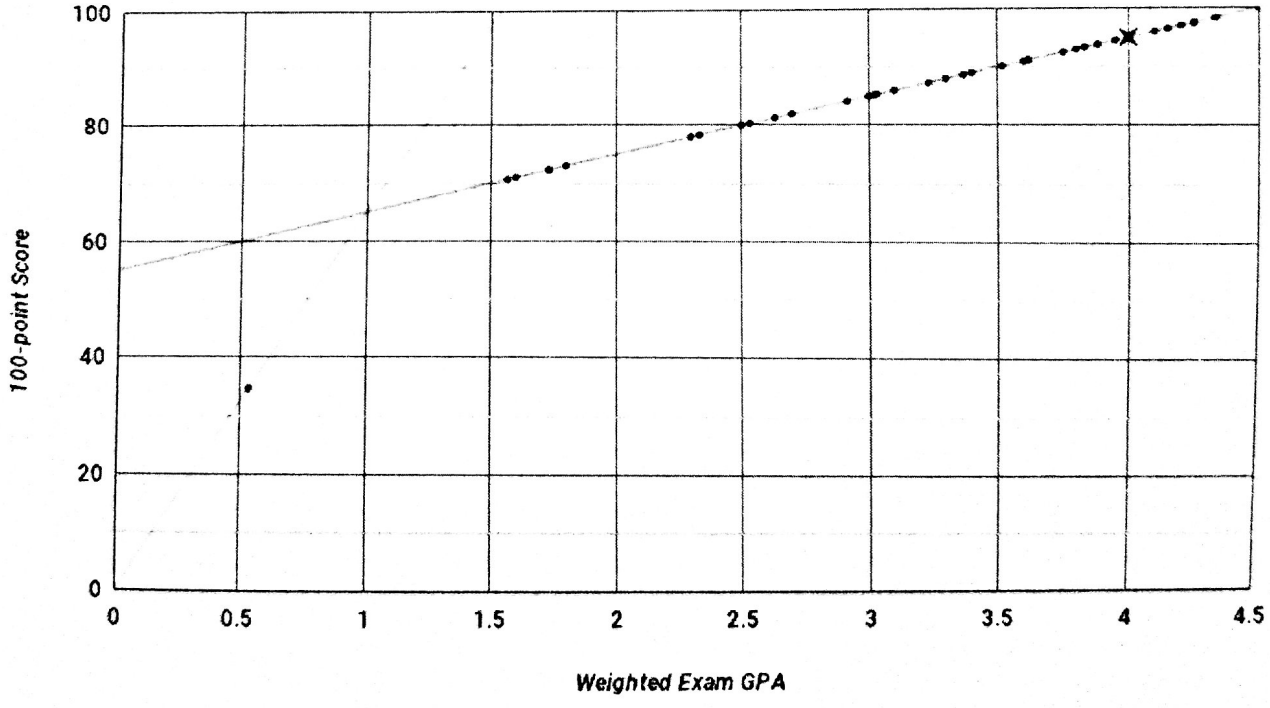
Pretest Score Summary

Goulette,Spencer J

	Problem Grade	Grade Points	Weight
Problem 1	A-	3.67	30%
Problem 2	A-	3.67	30%
Problem 3	A+	4.50	20%
Problem 4	A+	4.50	20%
Weighted Exam GPA:	**4.00**		

GPA > 1.0: Recorded 100-pt Score = 65.0+10.0(GPA-1.0)
GPA < 1.0: Recorded 100-pt Score = 65.0(GPA)

GPA to 100-point score mapping



Recorded 100-point max score:	**95.00**	**A**

(90/80/70/60 Scale)

Class Average GPA: 3.18
Class Average 100-pt score: 86.18

ECE-314 Pretest, Sept 11, 2018

1 Hour; Closed book; No calculators.

Name : Spencer Coulette

1. (30%) Evaluate the following expressions to give numerical results in the form $x + jy$, where x and y are real. (Or just provide the numerical value for a real result.)

(a) $3e^{j\pi/2}(5 + j6)$

$(0 + j3)(5 + j6) = j15 + (-18) = \boxed{-18 + j15}$ ✓

(b) $\frac{e^{j\pi/4}}{2 - j2} = \frac{e^{j\pi/4}}{2\sqrt{2}e^{j\pi/4}} = \frac{1}{2\sqrt{2}} e^{j\pi/2} = \boxed{0 + j\frac{1}{2\sqrt{2}}} = 0 + j\frac{\sqrt{2}}{4}$ ✓

(c) $\left|\frac{1}{5 + j3}\right| = \frac{1}{\sqrt{5^2 + 3^2}} = \frac{1}{\sqrt{25 + 9}} = \boxed{\frac{1}{\sqrt{34}}} = \frac{\sqrt{34}}{34}$ ✓

(d) $\left|3 + \sqrt{2}e^{j\pi/4}\right|$

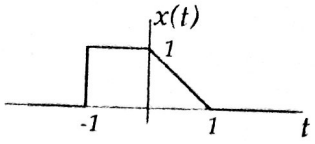
$|3 + 1 + j| = \sqrt{3^2 + 1^2 + 1^2} = \boxed{\sqrt{11}}$ ✗

(e) $|e^{(3+j2)}| = |e^3 e^{j2}| = \boxed{e^3}$ ✓

A-

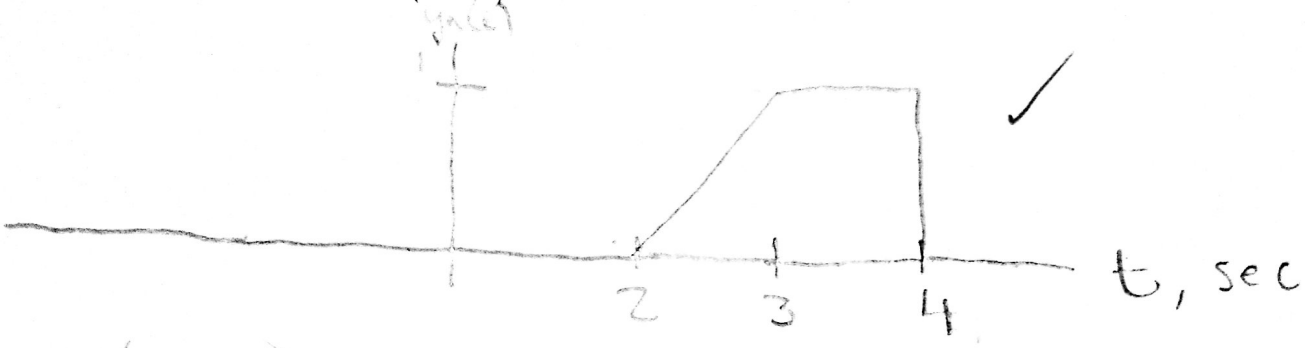
2. (30%) The function $x(t)$ is defined by

$$x(t) = \begin{cases} 1, & -1 \le t \le 0 \\ 1-t, & 0 < t < 1 \\ 0, & \text{elsewhere} \end{cases}$$

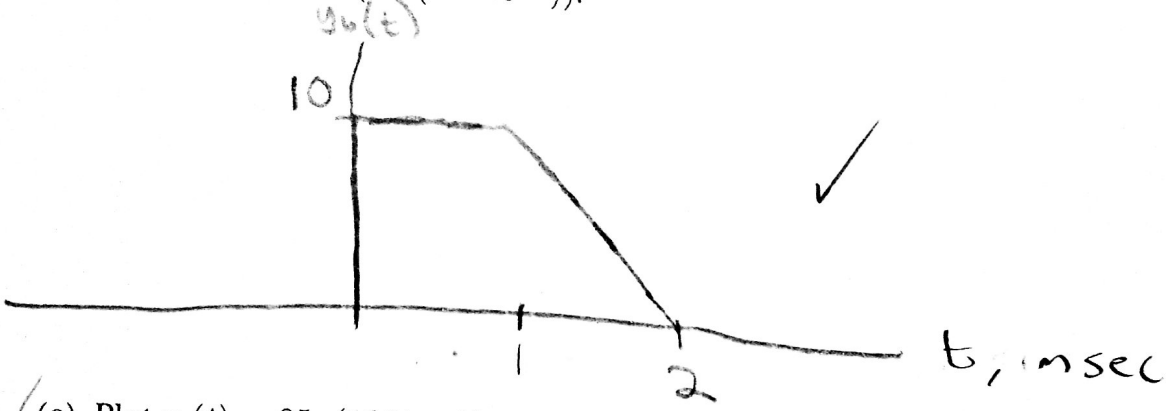


Provide a plot of each of the following functions:

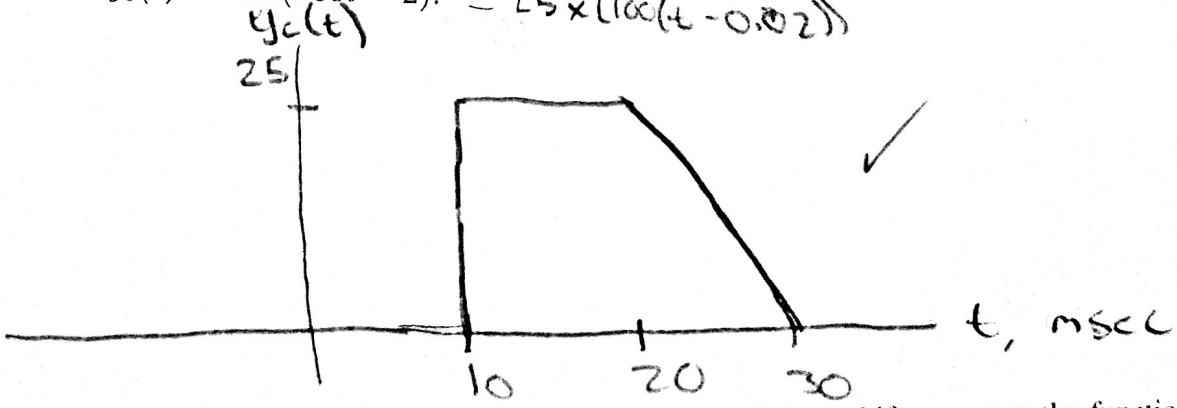
(a) Plot $y_a(t) = x(3-t)$.



(b) Plot $y_b(t) = 10x(10^3(t-10^{-3}))$.

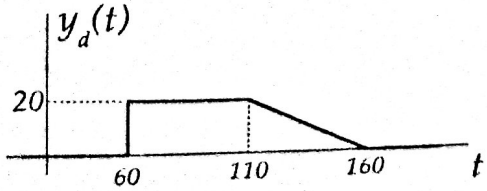


(c) Plot $y_c(t) = 25x(100t-2)$. $= 25 \times (10x(t-0.02))$



(d) Using only linear amplitude scales, time scales, and time shifts, express the function $y_d(t)$ in terms of the function $x(t)$.

$y_d(t) = 20 \times (0.02(t-5\cancel{500}))$



A-

3. (20%) Assume $x(t) = Ae^{-bt}\cos(2\pi f_0 t)$ for $t > 0$, where A, b, and f_0 are constants and t is in seconds. Give an equation for $\frac{dx}{dt}$.

$$\frac{dx}{dt} = -Abe^{-bt}\cos(2\pi f_0 t) - Ae^{-bt}\sin(2\pi f_0 t)\cdot 2\pi f_0$$

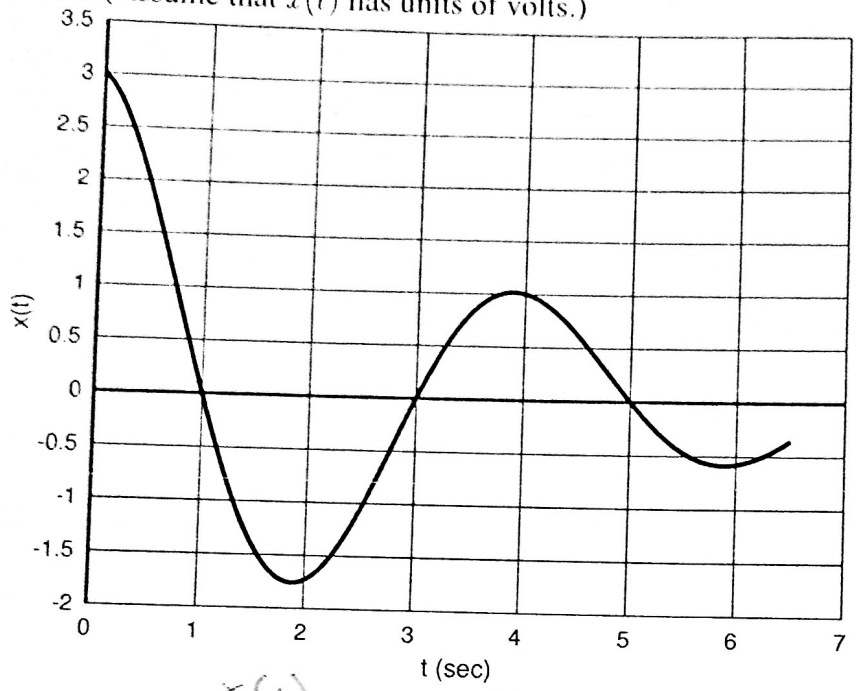
$$\frac{dx}{dt} = -Ae^{-bt}\left(b\cos(2\pi f_0 t) + 2\pi f_0 \sin(2\pi f_0 t)\right) \quad \text{for } t>0$$

$$\frac{dx(0)}{dt} = -Ae^{0}(b\cos(0) + 2\pi f_0 \sin(0)) = 0$$

$$-Ab = 0$$

Ar

4. (20%) A plot of the signal $x(t) = Ae^{-bt}\cos(2\pi f_0 t)$ from problem 3 is provided below. Determine the parameters A, b, and f_0 from the plot. Give numerical results, and include units. (Assume that $x(t)$ has units of volts.)



$x(t) = Ae^{-bt}\cos(2\pi f_0 t)$

$x(0) = A \cdot e^{0} \cdot \cos(0) = 3$

$A = 3$ Volts

$T_0 = 4$ sec

$f_0 = 0.25$ Hz

$x(4) = 3e^{-b(4)}\cos(0) = 1$

$e^{-b(4)} = \frac{1}{3}$

$-b(4) = -\ln(3)$

$b = \frac{\ln(3)}{4}$

$A = 3$ volts $\quad b = \frac{\ln(3)}{4}$ rad/sec $\quad f_0 = 0.25$ Hz

A+