Dawson College
Mathematics Department
Final Exam

Math 943.DW **Applied Mathematics** **Fall 2009**

Date: **December 11, 2009**

Time: **9:30 AM to 12:30 PM**

Teachers: **Gilbert Honnouvo**
Glen A. Goodale

Student Name(print):_____

Student Name (sign):_____

Instructions:

- Print and sign your name in the space provided above.
- Part marks will be allotted only when work is shown.
- Round numeric answers to 4 significant figures.
- Use engineering notation.

question	1	2	3	4	5	6	7	8	9	10	B	total
possible marks	6	6	8	18	10	12	4	6	15	15	5	100
earned marks												

November 28,2009/gag

(6) 1. With your calculator set to degrees, find the value of:

a $-3^2 \sec(23) + 2\ln^3(3^2)$

b. $\dfrac{2\log_3(4^5) - \sqrt{4.56k}}{\cos^{-1}(-380m)}$

(6) 2. Simplify the fraction below, reducing it to a maximum of two levels, with no brackets, no negative exponents, and no j left in the denominator.

$$2\left[\frac{\frac{3+jX}{2} - 2}{2 - \frac{8}{3+jX}}\right]$$

(8) 3. The resistance R of a thermistor is a linear function of temperature T. If R = 1.23 kΩ at 10°C, and 1.32 kΩ at 40°C, find the linear function for calculating resistance from temperature, and use it to calculate the resistance at 85°C.

(18) 4. Solve each of the following equations for x.

a. $\dfrac{x}{2x^2 + 3x} + \dfrac{3}{4} = \dfrac{1}{2x}$

b. $\ln^2(2+x) = \ln(2+x)^2$

c. $4^{2x} = 8^{3x-4}$

(10) 5. Solve the trig equation for A, where **0 ≤ A < 360 degrees**.

$6\sin(A) + 6\csc(A) + 13 = 0$

(12) 6. Using Kirchhoff's Laws, with the Circuit shown at the right, the equations below are found. Find the 3 currents I_1, I_2, and I_3. [cut and paste circuit here.]

$1.0I_1 + 3.0(I_2 - I_3) = 12$

$2.0I_2 + 4.0(I_2 + I_3) = 12$

$1.0I_1 - 2.0I_2 + 3.0I_3 = 0$

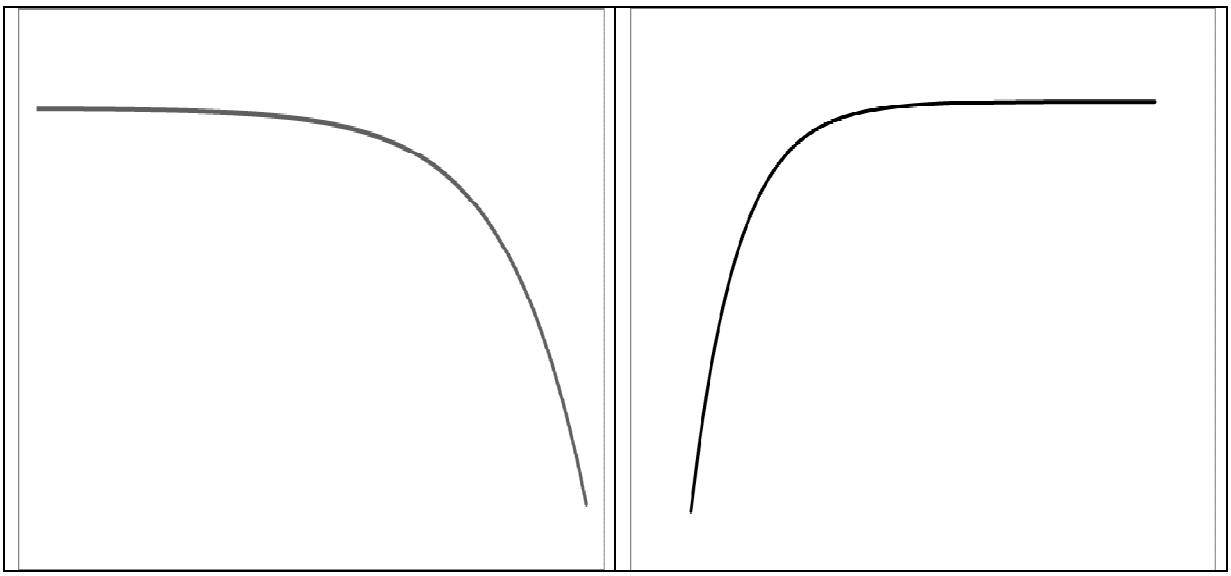
(4) 7. Identify the graphs below, by writing on each graph the letter that corresponds to one of the formulas below. (note: A, B, C, and k are all positive.)

a. $y = A(-B - Ce^{-kt})$

b. $y = -A(B + Ce^{kt})$

c. $y = A(-B + Ce^{kt})$

d. $y = -A(B - Ce^{-kt})$



(6) 8. Fill in the missing boxes. **(all angles are in radians.)**

rectangular form	**polar form**	**exponential form**
-2 + 3j		
	$4\angle -5$	
		$7e^{7j}$

(15) 9.a A fully charged 9V battery decays (exponentially) to 6 volts in 10 weeks. Assuming the formula for the battery voltage is of the general form $v = Ae^{kt}$, find the exact formula describing the battery voltage.

b. Find v when t = 23 weeks.

c. Find t when v = 2 Volts.

d. What is the time-constant, τ ?

(15) 10. Solve for the complex number Z, giving your answer in rectangular form, a + bj.

a. $6jZ + (2 - \sqrt{-4})Z = \left[(Z + 2j)3 - 13\right]j$

b. $Z = \sqrt{7 - 24j}$

c. $Z[Z + 3] - 5jZ = 7.5j - 5$

(5) Bonus: (Optional) $Y = Ae^{kx}$ passes through the points (3, 5) and (7, 9). Find A and K.

Answers to Math 943.DW Final Exam Fall 1009

1a. 11.44; b. -0.4888 2. (3.jX)/2

3. R = 3T + 1.2 kΩ $R = 1.455\ k\Omega$

4.a X = -2 or X = 0.5 b. X = -1 or X = 5.389

c. X = 2.4 5. A = 221.81^{o} or 318.19^{o}

6. I_1 = 4.929 A; I_2 = 2.143 A; I_3 = -0.214 A

7. left figure is ‘b’; right figure is ‘a’

8.

rectangular form	polar form	exponential form
-2 + 3j	3.606/2.159	$3.606e^{2.159j}$
1.135 + 3.836j	4/-5	$4e^{-5j}$
5.277 + 4.599j	7/7	$7e^{7j}$

9.a v = $9e^{-40.55mt}$ Volts; b. v = 3.542 Volts

.c t = 37.09 weeks d. τ = 24.66 weeks.

10.a Z = -5 -4j b. Z = 4 – 3j

.c Z = -1.5 + 5.5j or -1.5 - 0.5j

Bonus: A = 3.217 k = 0.1469