1. Using the integrating factor to solve the following differential equations for general solution.

(a) $(2\cos y + 4x^2)\,dx = x \sin y\,dy$ (10%)

(b) $xy\,dx + 2x^2\,dy = 0$ (10%)

2. Let $z = x + iy$. Solve the following problems.

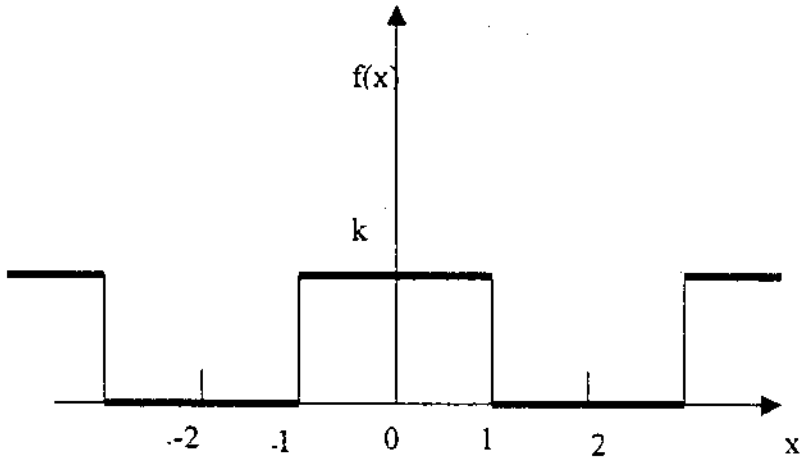
(a) Find all z such that $\sin z = 1/2$. (10%)

(b) Evaluate the $\int_C (1/z)dz$, where C is the straight line segment from i to $2 + 4i$. (10%)

3. $A = \begin{bmatrix} -3 & 2 \\ 1 & -4 \end{bmatrix}$, compute A^8. (10%)

4. Find the Fourier series of the following function: (20%)

$$f(x) = \begin{cases} 0 & \text{if } -2 < x < -1 \\ k & \text{if } -1 < x < 1 \\ 0 & \text{if } 1 < x < 2 \end{cases} \qquad p = 2L = 4$$



5. Solve the following system by the Gauss elimination: (20%)

$$5X_1 + X_2 - 3X_3 = 17$$

$$-5X_2 + 15X_3 = -10$$

$$2X_1 - 3X_2 + 9X_3 = 0$$

6. Determine the mean and standard deviation of the following data: (10%)

89 84 87 81 89 86 91 90 78 89 87 99 83 89