

一、Find the limit : (20%)

1.  $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2}$

2.  $\lim_{h \rightarrow 0} \frac{(4+h)^2 - 16}{h}$

二、Evaluate the integrals : (20%)

1.  $\int_{-1}^2 \frac{2x}{x^2 - 7} dx,$

2.  $\int_1^e \ln x dx$

三、Use a double integral to find the area of the region bounded by  $y = x^2$ ,  $y = x^2/8$ , and  $y = 1/x$ , and the area is located within the first quadrant.  
 $\ln 2 = 0.6931$  (10%)

四、Find the point  $P(x, y, z)$  on the plane  $2x + y - z - 5 = 0$  that lies closest to the origin. (10%)

五、 $A = \begin{bmatrix} 9 & 4 & -3 \\ -2 & 0 & 6 \\ -1 & -4 & 11 \end{bmatrix}$ , Find :

(1)  $|A^{-1}|$

(2)  $|A^T|$

(3) the rank of A

(4) the real eigenvalues of A

(5) a basis for the eigenspace corresponding.

(6)  $A^4$

(30%)

$$\begin{aligned}x_1 + x_2 &= 0 \\x_2 + x_3 - 2x_4 &= 1 \\x_1 + 2x_3 + x_4 &= 0 \\x_1 + x_2 + x_4 &= 0\end{aligned}$$

use Cramer's rule or Gauss Jordan Elimination to solve the system of linear equations. (10%)