Homework #1

Due Jan 31, 2022, 11:59pm

Problem 1.1. Analytically calculate the inverse of the following matrices

$$A = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 & 0 \\ 0 & 0 & 3 & 0 & 0 \\ 0 & 0 & 0 & 4 & 0 \\ 0 & 0 & 0 & 0 & 5 \end{pmatrix}$$

$$\mathrm{B} = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 4 & 5 & 6 \\ 3 & 4 & 5 & 6 & 7 \\ 4 & 5 & 6 & 7 & 8 \\ 5 & 6 & 7 & 8 & 9 \end{pmatrix}$$

$$C = \begin{pmatrix} 1 & p & p^2 \\ p & 1 & p \\ p^2 & p & 1 \end{pmatrix}, \text{ with } p \neq 1$$

Problem 1.2. Given the function *g(x)* as

$$g(x) = \sin^2 x \cos x$$

a) analytically calculate its second derivative with respect to x

b) What is the integral of the second derivative from (0,π/2)?

Problem 1.3. What is the value of the following integral?

$$D = \int_0^1 dx(1+x) \int_0^x dy\, y(1-y^2)$$