Entry Quiz

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1. Differentiate the following expressions

   (a) $y = x^n$

   (b) $y = \frac{\log(x)}{x}$

   (c) Compute $\frac{\partial z}{\partial x}$ where $z = x\sin(y)$

2. Integrate the following expressions

   (a) $y = \frac{1}{x}$

   (b) $y = x\sin(x)$

3. Use first order Taylor's expansion to compute $\cos(0.01)$ (recall that $\cos(0) = 1$)

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4. Compute the dot product of the vectors $\mathbf{a} = [1, 2, 1]$ and $\mathbf{b} = [1, 2, 3]$.

5. Compute the product of the matrix $\mathbf{A}$ and the matrix $\mathbf{x}$ where

$$\mathbf{A} = \begin{pmatrix} 0 & 1 & -1 \\ -1 & 0 & 2 \\ 1 & -2 & 0 \end{pmatrix} \qquad \mathbf{x} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$$

6. Solve the linear system

$$\begin{pmatrix} 2 & 1 \\ 1 & 2 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} 4 \\ 5 \end{pmatrix}$$

7. Find the eigenvalues of the matrix

$$\begin{pmatrix} 2 & 1 \\ 1 & 2 \end{pmatrix}$$