Homework 0

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Name

Compute the following values using linear algebra and calculus. You may use a textbook or the internet to find the algorithms but may not use a computer or calculator to perform the math. Show your work.

1. Determinant

$$\begin{vmatrix} 1 & 3 \\ 7 & 5 \end{vmatrix} =$$

2. Matrix product

$$\begin{bmatrix} 1 & 7 \\ x & 4 \end{bmatrix}\begin{bmatrix} 2 \\ -y \end{bmatrix} =$$

3. Inverse

$$\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}^{-1} =$$

4. Matrix product

$$\begin{bmatrix} 1 & 6 & \cos\theta \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix} =$$

5. Indefinite integral

$$\int x \, dx =$$

6. Definite integral (hint: the derivative of cos y is $-\sin y$; the derivative of sin y is cos y)

$$\int_0^1 \int_0^{2\pi} x \cos\phi \; \partial\phi \; \partial x =$$

7. Partial derivative

$$\frac{\partial \left[x_0 + vt + \frac{1}{2} at^2 \right]}{\partial t} =$$

8. Solve this linear system for x:

$$\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} \bar{x} = \begin{bmatrix} 3 \\ -1 \end{bmatrix}$$

9. Solve this linear system for x:

$$\mathbf{A}\bar{x} = \bar{b}$$

10. What is the a priori probability two independent, fair 6-sided die rolls summing to either 6 or 8?

11. Write a method or function in the programming language of your choice to convert a 16-bit integer into a string representing the same value in hexadecimal. E.g., 249 -> "F9". You may not use any "toHex" or similar library functions. Specify the language that you used.

12. Given square invertible matrices $\mathbf{A}$ and $\mathbf{B}$, and permutation matrix $\mathbf{P}$ such that $\mathbf{B} = \mathbf{PA}$, prove that $\mathbf{P}(x^{\mathrm{T}}\mathbf{A}^{-1})^{\mathrm{T}} = (\mathbf{B}^{\mathrm{T}})^{-1}x$ for all x.