

Name: _____

Points: /25

1. Does the equation

$$\sin(xy) + e^x - x = 0$$

define a function $y(x)$ on the neighborhood of $(1, 0)$? If yes, compute $y'(1)$.

Points: /6

2. Examine the local extremes of

$$f(x, y) = x^3 + x^2y - 3xy$$

Points: /5

3. Find extremes of

$$f(x, y) = x^2 + 2y^2 - x$$

subject to the constraint

$$x^2 + y^2 = 9$$

Points: /6

4. Find the fundamental system for

$$x' = \begin{pmatrix} 1 & 0 \\ 2 & -2 \end{pmatrix} x$$

Points: /4

5. The fundamental system set of the system

$$x' = \begin{pmatrix} 2 & -3 \\ 1 & -2 \end{pmatrix} x$$

is

$$F.S. = \left\{ e^t \begin{pmatrix} 3 \\ 1 \end{pmatrix}, e^{-t} \begin{pmatrix} 1 \\ 2 \end{pmatrix} \right\}.$$

Find the particular solution satisfying

$$x(0) = \begin{pmatrix} 5 \\ 0 \end{pmatrix}.$$

Points: /4