Notes 37 **Name** _____

8.5 (Determinants and Cramer's Rule)

Determinant of a 2x2 Matrix

$$D=\begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix} = a_{11}\left(a_{22}\right)-a_{12}\left(a_{21}\right)$$

Determinant of a 3x3 Matrix

$$D=\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = a_1\begin{vmatrix} b_2 & c_2 \\ b_3 & c_3 \end{vmatrix} - a_2\begin{vmatrix} b_1 & c_1 \\ b_3 & c_3 \end{vmatrix} + a_3\begin{vmatrix} b_1 & c_1 \\ b_2 & c_2 \end{vmatrix}$$

Evaluating the Determinant: *Evaluate each determinant.*

1) $\begin{vmatrix} 7 & 9 \\ -2 & -5 \end{vmatrix}$

2) $\begin{vmatrix} 4 & 0 & 0 \\ 3 & -1 & 4 \\ 2 & -3 & 5 \end{vmatrix}$

Solving a Two Variable System Using Cramer's Rule

If $\begin{matrix} a_1x+b_1y=c_1 \\ a_2x+b_2y=c_2 \end{matrix}$, Then $x=\dfrac{\begin{vmatrix} c_1 & b_1 \\ c_2 & b_2 \end{vmatrix}}{\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}}$ and $y=\dfrac{\begin{vmatrix} a_1 & c_1 \\ a_2 & c_2 \end{vmatrix}}{\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}}$, where $\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} \neq 0$

Solving a Two Variable System Using Cramer's Rule: *Use Cramer's rule to solve each system or to determine that the system is inconsistent or contains dependent equations.*

3) $\begin{matrix} 3x+2y=2 \\ 2x+2y=3 \end{matrix}$

4) $\begin{matrix} 3x=2-3y \\ 2y=3-2x \end{matrix}$

Solving a Three Variable System Using Cramer's Rule

If $\begin{aligned} a_1x+b_1y+c_1z&=d_1\\ a_2x+b_2y+c_2z&=d_2\\ a_3x+b_3y+c_3z&=d_3 \end{aligned}$, Then $x=\frac{D_x}{D}, y=\frac{D_y}{D}$ and $z=\frac{D_z}{D}$

$$D=\begin{vmatrix} a_1 & b_1 & c_1\\ a_2 & b_2 & c_2\\ a_3 & b_3 & c_3 \end{vmatrix}, D_x=\begin{vmatrix} d_1 & b_1 & c_1\\ d_2 & b_2 & c_2\\ d_3 & b_3 & c_3 \end{vmatrix}, D_y=\begin{vmatrix} a_1 & d_1 & c_1\\ a_2 & d_2 & c_2\\ a_3 & d_3 & c_3 \end{vmatrix}, D_z=\begin{vmatrix} a_1 & b_1 & d_1\\ a_2 & b_2 & d_2\\ a_3 & b_3 & d_3 \end{vmatrix}$$

Solving a Three Variable System Using Cramer's Rule: *Use Cramer's rule to solve each system or to determine that the system is inconsistent or contains dependent equations.*

5) $\begin{aligned} 4x-5y-6z&=-1\\ x-2y-5z&=-12\\ 2x-y&=7 \end{aligned}$

6) $\begin{aligned} 2x+2y+3z&=10\\ 4x-y+z&=-5\\ 5x-2y+6z&=1 \end{aligned}$