

Find the partial fraction decomposition.

$$1.) \frac{x+7}{x^2-x-6} \rightarrow \frac{x+7}{(x-3)(x+2)}$$

$$x+7 = A(x-3) + B(x+2)$$

$$x+7 = Ax - 3A + Bx + 2B$$

$$x+7 = Ax + Bx - 3A + 2B$$

$$x = Ax + Bx \rightarrow 1 = A + B$$

$$7 = -3A + 2B \quad 7 = -3A + 2B$$

$$\begin{bmatrix} 1 & 1 \\ -3 & 2 \end{bmatrix}^{-1} \begin{bmatrix} 1 \\ 7 \end{bmatrix} = \begin{bmatrix} -1 \\ 2 \end{bmatrix}$$

$$\boxed{\frac{-1}{x+2} + \frac{2}{x-3}}$$

$$2.) \frac{9x-7}{2x^2-3x+1} \rightarrow \frac{9x-7}{(2x-1)(x-1)}$$

$$9x-7 = A(2x-1) + B(x-1)$$

$$9x-7 = 2Ax - A + Bx - B$$

$$9x = 2Ax + Bx$$

$$-7 = -A - B$$

$$9 = 2A + B$$

$$-7 = -A - B$$

$$\begin{bmatrix} 2 & 1 \\ -1 & -1 \end{bmatrix}^{-1} \begin{bmatrix} 9 \\ -7 \end{bmatrix} = \begin{bmatrix} 2 \\ 5 \end{bmatrix}$$

$$\boxed{\frac{2}{x-1} + \frac{5}{2x-1}}$$

$$3.) \frac{7x-26}{x^2-6x-16} \rightarrow \frac{7x-26}{(x-8)(x+2)}$$

$$7x-26 = A(x-8) + B(x+2)$$

$$7x-26 = Ax - 8A + Bx + 2B$$

$$7x = Ax + Bx$$

$$-26 = -8A + 2B$$

$$\begin{bmatrix} 1 & 1 \\ -8 & 2 \end{bmatrix}^{-1} \begin{bmatrix} 7 \\ -26 \end{bmatrix} = \begin{bmatrix} 4 \\ 3 \end{bmatrix}$$

$$\boxed{\frac{4}{x+2} + \frac{3}{x-8}}$$

$$4.) \frac{-3x-23}{x^2-x-12} \rightarrow \frac{-3x-23}{(x-4)(x+3)}$$

$$-3x-23 = A(x-4) + B(x+3)$$

$$-3x-23 = Ax - 4A + Bx + 3B$$

$$-3x = Ax + Bx$$

$$-23 = -4A + 3B$$

$$\begin{bmatrix} 1 & 1 \\ -4 & 3 \end{bmatrix}^{-1} \begin{bmatrix} -3 \\ -23 \end{bmatrix} = \begin{bmatrix} 2 \\ -5 \end{bmatrix}$$

$$\boxed{\frac{2}{x+3} + \frac{-5}{x-4}}$$

Find the inverse.

5.) $\begin{bmatrix} 2 & -6 \\ 3 & -7 \end{bmatrix}$

$$\begin{bmatrix} -1.75 & 1.5 \\ -.75 & .5 \end{bmatrix}$$

Multiply.

6.) $\begin{bmatrix} 1 & 7 \\ 0 & 9 \end{bmatrix} \begin{bmatrix} 3 & -1 & 8 \\ 2 & -4 & 8 \end{bmatrix}$

$$\begin{bmatrix} 17 & -29 & 64 \\ 18 & -36 & 72 \end{bmatrix}$$

Create two matrices for the situation, then use matrix multiplication to solve the problem

7. John and Phil decide to make two bouquets for their wives. John's bouquet contains 4 roses, 5 carnations and 3 lilies. Phil's bouquet contains 6 roses, 4 carnations and 3 lilies. Find the cost of each bouquet if each rose cost \$3, each carnations cost \$1.25 and each lily cost \$4.

$$\begin{array}{l} \text{John} \\ \text{Phil} \end{array} \begin{bmatrix} 4 & 5 & 3 \\ 6 & 4 & 3 \end{bmatrix} \cdot \begin{bmatrix} \$3 \\ \$1.25 \\ \$4 \end{bmatrix} \begin{array}{l} \text{Roses} \\ \text{carnations} \\ \text{lilies} \end{array}$$

$$\begin{array}{l} \text{John} \\ \text{Phil} \end{array} \begin{bmatrix} \$30.25 \\ \$35 \end{bmatrix}$$

8. A school store recorded how many pencils, erasers, and binders they sold for two different days. On Monday they sold 48 pencils, 7 erasers, and 9 binders. On Tuesday they sold 54 pencils, 10 erasers, and 6 binders. If the price of each pencil, eraser, and binder, respectively, is \$0.20, \$0.35, and \$2.85, how much was made each day?

$$\begin{array}{l} \text{Monday} \\ \text{Tuesday} \end{array} \begin{bmatrix} 48 & 7 & 9 \\ 54 & 10 & 6 \end{bmatrix} \cdot \begin{bmatrix} .20 \\ .35 \\ 2.85 \end{bmatrix}$$

$$\begin{array}{l} \text{Monday: } \$37.70 \\ \text{Tuesday: } \$31.40 \end{array}$$