1. $\begin{pmatrix} 5 & 2 \end{pmatrix} \begin{pmatrix} 6 \\ 8 \end{pmatrix}$

   $= 30 + 16$

   $= 46$

2. $\begin{pmatrix} 3 & 10 \end{pmatrix} \begin{pmatrix} 1 \\ 7 \end{pmatrix}$

   $= 3 + 70$

   $= 73$

3. $\begin{pmatrix} 1 & -2 & 4 \end{pmatrix} \begin{pmatrix} 2 \\ 3 \\ 3 \end{pmatrix}$

   $= 2 + -6 + 12$

   $= 8$

4. $\begin{pmatrix} 1 & 5 \end{pmatrix} \begin{pmatrix} -5 \\ 1 \end{pmatrix}$

   $= -5 + 5$

   $= 0$

   $\langle \begin{pmatrix} 1 \\ 5 \end{pmatrix} \begin{pmatrix} -5 \\ 1 \end{pmatrix} \rangle \equiv 0$

5. $\begin{pmatrix} 3 & 6 & 2 \end{pmatrix} \begin{pmatrix} 1 \\ 4 \\ 3 \end{pmatrix}$

   $= 3 + 12 + 6$

   $= 21$

6. $\begin{pmatrix} 5 \\ 5 \end{pmatrix} = x \begin{pmatrix} 1 \\ 2 \end{pmatrix} + y \begin{pmatrix} 3 \\ 1 \end{pmatrix}$

   $5 = x + 3y$

   $5 = 2x + y$

   $\begin{aligned}
   x + 3y &= 5 |\cdot 2| \\
   2x + y &= 5 |\cdot 1| \\
   \hline
   2x + 6y &= 10 \\
   2x + y &= 5 \quad - \\
   \hline
   5y &= 5 \\
   y &= 1
   \end{aligned}$

   $5 = 2x + y$

   $5 = 2x + 1$

   $5 - 1 = 2x$

   $4 = 2x$

   $x = 2$

   $x = 2; y = 1$

7. $\begin{pmatrix} -7 \\ 16 \end{pmatrix} = x \begin{pmatrix} 1 \\ 2 \end{pmatrix} + y \begin{pmatrix} 3 \\ 1 \end{pmatrix}$

   $-7 = x + 3y$

   $16 = 2x + y$

$$-7 = x + 3y|\cdot 2|$$
$$\underline{16 = 2x + y|\cdot 1|}$$
$$-14 = 2x + 6y$$
$$\underline{16 = 2x + y} \quad - \quad -7 = x + -18$$
$$-30 = 5y$$
$$-\frac{30}{5} = y$$
$$-6 = y$$
$$-x = -18 + 7$$
$$\cancel{-}x = \cancel{-}11$$
$$x = 11$$
$$x = 11; y = -6$$

8. $\begin{pmatrix} 2 & 3 \\ 1 & 4 \end{pmatrix} \begin{pmatrix} 3 \\ -2 \end{pmatrix}$

$= \begin{pmatrix} (2 \cdot 3) + (3 \cdot -2) \\ (1 \cdot 3) + (4 \cdot -2) \end{pmatrix}$

$= \begin{pmatrix} 6 + -6 \\ 3 + -8 \end{pmatrix}$

$= \begin{pmatrix} 0 \\ -5 \end{pmatrix}$

9. $\begin{pmatrix} 1 & 4 \\ 0 & 5 \end{pmatrix} \begin{pmatrix} 1 \\ 1 \end{pmatrix}$

$= \begin{pmatrix} (1 \cdot 1) + (4 \cdot 1) \\ (1 \cdot 0) + (5 \cdot 1) \end{pmatrix}$

$= \begin{pmatrix} 1 + 4 \\ 0 + 5 \end{pmatrix}$

$= \begin{pmatrix} 5 \\ 5 \end{pmatrix}$

10. $\begin{pmatrix} -2 & 6 \\ 9 & 4 \end{pmatrix} \begin{pmatrix} 3 & 3 \\ -5 & 1 \end{pmatrix}$

$= \begin{pmatrix} (-2 \cdot 3 + 6 \cdot -5) & (-2 \cdot 3 + 6 \cdot 1) \\ (9 \cdot 3 + 4 \cdot -5) & (9 \cdot 3 + 4 \cdot 1) \end{pmatrix}$

$= \begin{pmatrix} -36 & 0 \\ 7 & 31 \end{pmatrix}$

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