Math 2312: **Pre-Calculus** ***Solution*** ***Sec* 5.2**

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**1.** $\dfrac{2s-1}{(s+1)(s-2)}=\dfrac{A}{s+1}+\dfrac{B}{s-2}$

$2s-1=(A+B)s-2A+B$

$$\begin{cases} A+B=2 \\ -2A+B=-1 \end{cases} \Rightarrow A=B=1$$

$$\underline{\left|\dfrac{2s-1}{(s+1)(s-2)}=\dfrac{1}{s+1}+\dfrac{1}{s-2}\right|}$$

**2.** $\dfrac{2s-2}{(s-4)(s+2)}=\dfrac{A}{s-4}+\dfrac{B}{s+2}$

$2s-2=(A+B)s+2A-4B$

$$\begin{cases} A+B=2 \\ 2A-4B=-2 \end{cases} \Rightarrow A=B=1$$

$$\underline{\left|\dfrac{2s-2}{(s-4)(s+2)}=\dfrac{1}{s-4}+\dfrac{1}{s+2}\right|}$$

**3.** $\dfrac{s^2+1}{s^3-2s^2-8s}=\dfrac{A}{s}+\dfrac{B}{s-4}+\dfrac{C}{s+2}$

$s^2+1=As^2-2As-8A+Bs^2+2Bs+Cs^2-4Cs$

$$\begin{matrix} s^2 \\ s^1 \\ s^0 \end{matrix}\begin{cases} A+B+C=1 \\ -2A+2B-4C=0 \\ -8A=1 \end{cases} \Rightarrow \underline{\left|A=-\frac{1}{8}\right|}$$

$$\begin{cases} B+C=\dfrac{9}{8} \\ 2B-4C=-\dfrac{1}{4} \end{cases}$$

$$B=\frac{\begin{vmatrix} \frac{9}{8} & 1 \\ -\frac{1}{4} & -4 \end{vmatrix}}{\begin{vmatrix} 1 & 1 \\ 2 & -4 \end{vmatrix}}=\frac{-\frac{17}{4}}{-6}=\underline{\left|\frac{17}{24}\right|} \qquad C=\frac{\begin{vmatrix} 1 & \frac{9}{8} \\ 2 & -\frac{1}{4} \end{vmatrix}}{-6}=\underline{\left|\frac{5}{12}\right|}$$

$$\underline{\left|\frac{s^2+1}{s^3-2s^2-8s}=-\frac{1}{8}\frac{1}{s}+\frac{17}{24}\frac{1}{s-4}+\frac{5}{12}\frac{1}{s+2}\right|}$$

**4.** $\dfrac{1}{x^2+2x} = \dfrac{A}{x} + \dfrac{B}{x+2}$

$1 = Ax + 2A + Bx$

$x \qquad 2A = 1 \qquad \rightarrow A = \dfrac{1}{2}$

$x^0 \qquad A + B = 0 \quad \rightarrow B = -\dfrac{1}{2}$

$$\underline{\dfrac{1}{x^2+2x} = \dfrac{1}{2}\dfrac{1}{x} - \dfrac{1}{2}\dfrac{1}{x+2}}$$

**5.** $\dfrac{2x+1}{x^2-7x+12} = \dfrac{A}{x-4} + \dfrac{B}{x-3}$

$2x + 1 = Ax - 3A + Bx - 4B$

$x \qquad A + B = 2$

$x^0 \qquad -3A - 4B = 1$

$$A = \frac{\begin{vmatrix} 2 & 1 \\ 1 & -4 \end{vmatrix}}{\begin{vmatrix} 1 & 1 \\ -3 & -4 \end{vmatrix}} = \frac{-9}{-1} = \underline{9} \qquad B = \frac{\begin{vmatrix} 1 & 2 \\ -3 & 1 \end{vmatrix}}{-1} = \frac{7}{-1} = \underline{-7}$$

$$\underline{\dfrac{2x+1}{x^2-7x+12} = \dfrac{9}{x-4} - \dfrac{7}{x-3}}$$