Partial fraction decomposition of $\dfrac{1}{x^2 - 5x + 6}$

1) First factor the bottom, as shown.

$$\frac{1}{(x-3)\cdot(x-2)}$$

2) Now we see the denomiatnor is a product of two linear factors.

2a) Write the setup for partial fractions.

$$\frac{1}{(x-3)\cdot(x-2)} = \frac{A}{(x-3)} + \frac{B}{(x-2)}$$

2b) Multiply both sides by (x-3)(x-2). This will clear the denominator on the left.

$$(x-3)(x-2)\cdot\frac{1}{(x-3)\cdot(x-2)} = \left[\frac{A}{(x-3)} + \frac{B}{(x-2)}\right]\cdot(x-3)(x-2)$$

$$\frac{(x-3)(x-2)}{(x-3)\cdot(x-2)}\cdot 1 = \frac{A}{x-3}\cdot(x-3)\cdot(x-2) + \frac{B}{(x-2)}\cdot(x-3)\cdot(x-2)$$

$$1 = A(x-2) + B(x-3)$$

3) Now you can solve for each of A and B.

Set x=2. This will give you B.

1=A(2-2)+B(2-3)
1=A(0)-B
1=-B
-1=B

Set x=3. This will give you A.

1=A(3-2)+B(3-3)
1=A(1)+B(0)
1=A

4) Now you can write the partial fraction decomposition as shown.

$$\frac{1}{x^2 - 5x + 6} = \frac{1}{x-3} - \frac{1}{x-2}$$