5.13.51

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If $A = \begin{pmatrix} \alpha & 0 \\ 1 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 0 \\ 5 & 1 \end{pmatrix}$, then value of α for which $A^2 = B$, is

2142infinite

Given:

$$A = \begin{pmatrix} \alpha & 0 \\ 1 & 1 \end{pmatrix}; B = \begin{pmatrix} 1 & 0 \\ 5 & 1 \end{pmatrix} \tag{1}$$

Outer product

Using outer product,

$$\begin{pmatrix} \alpha \\ 1 \end{pmatrix} \begin{pmatrix} \alpha & 0 \end{pmatrix} = \begin{pmatrix} \alpha^2 & 0 \\ \alpha & 0 \end{pmatrix} \tag{2}$$

$$\begin{pmatrix} 0 \\ 1 \end{pmatrix} \begin{pmatrix} 1 & 1 \end{pmatrix} = \begin{pmatrix} 0 & 0 \\ 1 & 1 \end{pmatrix} \tag{3}$$

Adding (2) and (3):

$$\begin{pmatrix} \alpha^2 & 0 \\ \alpha + 1 & 1 \end{pmatrix} \tag{4}$$

Equating (4) to B:

$$\alpha = \pm 1; \alpha = 4 \tag{5}$$

No finite α satisfies the above conditions. Hence α is infinite.

C Code

```c
#include<stdio.h>
int check(double input, int t){
    double matB[2][2] = {{1, 0}, {5, 1}};
    double matA2[2][2];
    matA2[0][0] = input*input;
    matA2[0][1] = 0;
    matA2[1][0] = input + 1;
    matA2[1][1] = 1;
    int k = 1;
    for(int i = 0; i<2; i++){
        for(int j = 0; j<2; j++){
            if(matA2[i][j]==matB[i][j]){
                continue;
            }
            else{
                k = 0;
                break;
            }
        }
    }
}
```

```c
        if(k==0){
            break;
        }
    }

    if(k==0){
        printf("Given alpha = %.2lf is not the solution\n", input
            );
        t++;
    }
    else if(k==1){
        printf("Given alpha = %.2lf is the solution\n", input);
    }
    return t;

}
```

C code

```c
int main(){
    double input[3] = {1, 2, 4};
    int t = 0;
    int k = 0;
    for(int i = 0; i<3; i++){
        t = k;
    k = check(input[i], t);
    }
    if(t==2){
        printf("only solution for the given question is alpha =
            infinity");
    }
}
```