Matrix A	**Matrix B**	**Answer**
1 3 4 5 7 6 8 1 4		-11/49 4/49 5/49 -2/7 2/7 -1/7 51/98 -23/98 4/49

Solution

The inverse of a matrix, or the reciprocal matrix, can be found in three steps. The first step required is to find the determinant of M, or |M|. The second step involves finding the adjugate of M, or adj(M). The third and final step is to scalar divide adj(M) by |M|.

Step 1, calculate |M|:

To find |M|, which is greater than [2 x 2], the minors of the first row of matrix M must be found by applying *determinant expansion by minors*, which will reveal the following minor matrices:

M.1	and	M.2	and	M.3
1 3 4 5 7 6 8 1 4		1 3 4 5 7 6 8 1 4		1 3 4 5 7 6 8 1 4

After re-writing the minor matrices we can calculate their determinants:

M.1	and	M.2	and	M.3
7 6 1 4		5 6 8 4		5 7 8 1

Find the determinant of the minor matrix M.1:

For a [2 x 2] matrix, the following formula is used to calculate the determinate:

If matrix M =
a b
c d

Then |M| = (a * d) - (b * c)

Therefore, to calculate the determinate for M.1, multiply a by b then subtract the product of b multiplied by c, which will result in:

(7 * 4) - (6 * 1)

|M.1|: 22

Find the determinant of the minor matrix M.2:

(5 * 4) - (6 * 8)

|M.2|: -28

Find the determinant of the minor matrix M.3:

(5 * 1) - (7 * 8)

|M.3|: -51

Get cofactors by applying the following signing pattern to the matrix:

+ - +		1 3 4		
- + -	applied to	5 7 6	=	1; -3; 4
+ - +		8 1 4		

Calculate the determinant by multiplying each cofactor by a corresponding minor matrix determinant:

(1 * 22) + (-3 * -28) + (4 * -51)

|M|: -98

Step 2, calculate adj(M):

To find adj(M), which is greater than [2 x 2], the minors of the matrix M must be found by applying *determinant expansion by minors*, which will reveal the following minor matrices:

M.1	M.2	M.3
1 3 4	1 3 4	1 3 4
5 7 6	5 7 6	5 7 6
8 1 4	8 1 4	8 1 4

M.4	M.5	M.6
1 3 4	1 3 4	1 3 4
5 7 6	5 7 6	5 7 6
8 1 4	8 1 4	8 1 4

M.7	M.8	M.9
1 3 4	1 3 4	1 3 4
5 7 6	5 7 6	5 7 6
8 1 4	8 1 4	8 1 4

After finding the minor matrices we calculate their determinants:

Find the determinant of the minor matrix M.1:

(7 * 4) - (6 * 1)

|M.1|: 22

Find the determinant of the minor matrix M.2:

(5 * 4) - (6 * 8)

|M.2|: -28

Find the determinant of the minor matrix M.3:

(5 * 1) - (7 * 8)

|M.3|: -51

Find the determinant of the minor matrix M.4:

(3 * 4) - (4 * 1)

|M.4|: 8

Find the determinant of the minor matrix M.5:

(1 * 4) - (4 * 8)

|M.5|: -28

Find the determinant of the minor matrix M.6:

(1 * 1) - (3 * 8)

|M.6|: -23

Find the determinant of the minor matrix M.7:

(3 * 6) - (4 * 7)

|M.7|: -10

Find the determinant of the minor matrix M.8:

(1 * 6) - (4 * 5)

|M.8|: -14

Find the determinant of the minor matrix M.9:

(1 * 7) - (3 * 5)

|M.9|: -8

From the determinants of minors create a new minor matrix:

|M.1|	|M.2|	|M.3|		22	-28	-51
|M.4|	|M.5|	|M.6|	=	8	-28	-23
|M.7|	|M.8|	|M.9|		-10	-14	-8

Get the cofactors matrix by applying the following signing pattern to the minor matrix:

+1	-1	+1		22	-28	-51		22	28	-51
-1	+1	-1	*	8	-28	-23	=	-8	-28	23
+1	-1	+1		-10	-14	-8		-10	14	-8

Create the adjugate by taking each row of the cofactors matrix and transforming it to a column in the adjugate matrix:

22	28	-51		22	-8	-10
-8	-28	23	becomes	28	-28	14
-10	14	-8		-51	23	-8

adj(M):

22	-8	-10
28	-28	14
-51	23	-8

Step 3, scalar divide adj(M) by |M|:

22	-8	-10			
28	-28	14	/	-98	=
-51	23	-8			

Divide each element in adj(M) by -98:

(22 / -98)	(-8 / -98)	(-10 / -98)
(28 / -98)	(-28 / -98)	(14 / -98)
(-51 / -98)	(23 / -98)	(-8 / -98)

Division result:

-11/49	4/49	5/49
-2/7	2/7	-1/7
51/98	-23/98	4/49

Answer:

-11/49	4/49	5/49
-2/7	2/7	-1/7
51/98	-23/98	4/49