1. Using matrix operations, describe the solutions for the following family of equations:

x + 2y - 3z = 5

2x + y - 3z = 13

-x + y = -8

**The system has infinitely many solutions.**

**Explanation**

**Step 1:** Multiply first equation by −2 and add the result to the second equation. The result is:

*x*−1 *x*+  2 *y*−   3 *y*+    *y*−   3 *z*+  3 *z* = 5 = 3 = −8

**Step 2:** Multiply first equation by 1 and add the result to the third equation. The result is:

*x*+  2 *y*−   3 *y*+  3 *y*−   3 *z*+  3 *z*−   3 *z* = 5 = 3 = −3

**Step 3:** Multiply second equation by 1 and add the result to the third equation. The result is:

*x*+  2 *y*−   3 *y*−   3 *z*+  3 *z*0 = 5 = 3 = 0

The last equation is always true. So the system has infinitely many solutions.

1. Provide a solution for #1, using R functions of your choice.

a <- matrix(c(1,2,-1,2,1,1,-3,-3,0),nrow=3,ncol=3)

b <- matrix(c(5,13,-8),nrow=3,ncol=1)

solve(a,b)

Result: solve.default(a, b) : Lapack routine dgesv: system is exactly singular: U[3,3] = 0

1. Solve for AB by hand:

= 4 x 1 + (-3) x 3 = -5

= 4 x 4 + (-3) x (-2) = 22

= -3 x 1 + 5 x 3 = 12

= -3 x 4 + 5 x (-2) = -22

= 0 x 1 + 1 x 3 = 3

= 0 x 4 + 1 x (-2) = -2

1. Solve AB from #3 using R functions of your choice.

e <- matrix(c(4,-3,0,-3,5,1),nrow=3,ncol=2)

d <- matrix(c(1,3,4,-2),nrow=2,ncol=2)k

c <- e %\*% d

c