1. Consider the train rendezvous problem in Section 8.2.4. In each of the following, give your answer as a double integral, \( dt \, ds \). In your electronic answers file, give your answer as five R expressions separated by commas (and optional spaces), as follows: lower limit in outer integral; upper limit in outer integral; lower limit in inner integral; upper limit in inner integral; integrand. For instance, for \[
\int_{3}^{8} \int_{s}^{1-s} (s+t)^2 \, dt \, ds
\]
write
\[3, 8, s, 1-s, (s+t)^2\]

(a) (15) Find \( P(X + Y > 1.8) \).

(b) (20) Find \( F_{X,Y}(0.4, 0.3) \).

2. Suppose the random vector \((X_1, X_2)'\) has mean vector \((1.5, 2.0)'\). Suppose also that each \(X_i\) has variance 4 and that \(\text{Cov}(X_1, X_2) = 1.0\).

(a) (15) Find \(E(2X_1 + 3X_2)\), as an R matrix expression.

(b) (15) Find \(\text{Var}(X_1 + X_2)\), as an R matrix expression.

3. The function below computes the correlation matrix corresponding to a given covariance matrix. Element \((i,j)\) of the latter is the correlation between the \(i^{th}\) and the \(j^{th}\) elements of the give random vector.

```r
covtocorr <- function(covmat) {
  n <- nrow(covmat)
  stddev <- vector(length=n)
  cormat <- matrix(nrow=n, ncol=n)
  for (i in 1:n) {
    stddev[i] <- sqrt(covmat[i, i])
    cormat[i, i] <- 1.0
  }
  for (i in 1:(n-1)) {
    for (j in (i+1):n) {
      tmp <- covmat[i, j] / (stddev[i]*stddev[j])
      cormat[i, j] <- tmp
      cormat[j, i] <- tmp
    }
  }
  return(cormat)
}
```

(a) (5) Fill in blank (a).

(b) (5) Fill in blank (b).

(c) (15) Fill in blank (c).

4. (15) Suppose we have three electronic parts, with independent lifetimes that are exponentially distributed with mean 2.5. They are installed simultaneously. Find the mean time until the last failure occurs.

Solutions:

1.a
\[0.8, 1, 1.8-s, 1, 2-s-t\]

1.a
\[0, 0.4, 0, 0.3, 2-s-t\]

2.a
\[c(2,3) \%\% c(1.5,2.0)\]

2.b
\[c(1,1) \%\% \text{matrix}(c(4,1,1,4), nrow=2) \%\% c(1,1)\]

3. As in the computer worm example in Section 8.3.8, the mean is
\[1/(3*0.4) + 1/(2*0.4) + 1/(1*0.4)\]