

Roots - Solutions

Problem 1.

```
# Declare Variables
k <- 0.016
cA0 <- 41
cB0 <- 28
cC0 <- 4
x <- seq(0,40,0.1)

# Rearrange Equation into a function
f <- function(x,k,cA0,cB0,cC0) (cC0+x)/((cA0-2*x)^2*(cB0-x)) - k
fx <- f(x,k,cA0,cB0,cC0)

# Plot equation
d <- data.frame(x,fx)
ggplot(d,aes(x,fx))+
  geom_line()+
  ylim(-0.3,0.3)

# Run uniroot
uniroot(f,c(10,20),k,cA0,cB0,cC0)

## $root
## [1] 15.54747
##
## $f.root
## [1] -7.042258e-08
```

Problem 2.

```
# Declare x
x <- seq(-1,3,0.01)

# Rearrange Equation into a function
f <- function(x) sin(x^2) + x^2 - 2*x - 0.09
fx <- f(x)

# Plot equation
d <- data.frame(x,fx)
ggplot(d,aes(x,fx))+
  geom_line()+
  ylim(-0.5,0.5)

# Run uniroot.all
uniroot.all(f, c(-1,3))

## [1] -0.04303572  1.33541680  1.37440489  2.34284750
```

Problem 3


```
# Declare variables
cP = 1.1
t <- seq(0,1200)

# Rearrange Equation into a function
f <- function(t) 0.99302 + 1.672e-4*t + 9.7216e-8*t^2 - 9.5837e-11*t^3 + 1.9320e-14*t^4
ft <- f(t)

# Plot of Cp versus temperature
d <- data.frame(t,ft)
ggplot(d,aes(t,ft))+
  geom_line()+
  ylab("Specific Heat [kJ/(kg K)]")+
  xlab("Temperature [K]") +
  theme_bw()

# Rearrange equation into a function that is equal to 0
f1 <- function(t,cP) 0.99302 + 1.672e-4*t + 9.7216e-8*t^2 - 9.5837e-11*t^3 + 1.9320e-14*t^4 - cP

ft1 <- f1(t,cP)

# Plot rearranged equation
d <- data.frame(t,ft1)
ggplot(d,aes(t,ft1))+
  geom_line()


# Run uniroot
uniroot(f1,c(0,1200),cP)

## $root
## [1] 549.946
##
## $f.root
## [1] 1.309735e-10
##
--
```