Load necessary packages

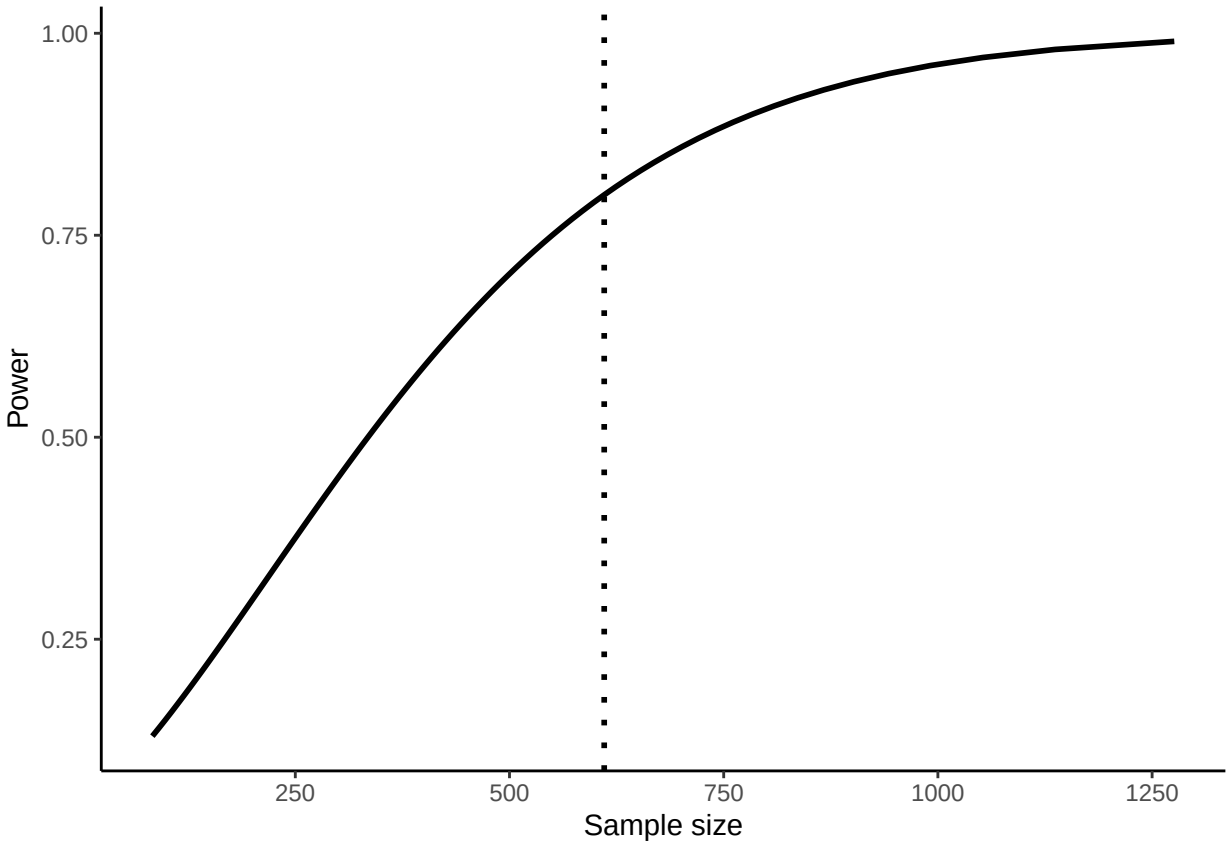
```
library(pwr)
library(WebPower)
library(tidyverse)
library(reshape2)
```

Power as a function of sample size (linear model)

```
power.vec <- seq(0.13, 0.99, 0.01)

# regression parameters based number of control variables and test variables in our # regressions
wp.regression(p1 = 13, p2 = 9, f2 = 0.02, alpha = 0.05, power = 0.8)
```

```
## Power for multiple regression
##
##            n p1 p2   f2 alpha power
##     610.5271 13  9 0.02  0.05   0.8
##
## URL: http://psychstat.org/regression
```

```
Power.func <- function(effect, power){
  # compute sample size required for power to measure a given effect at $\alpha = 0.05$
  # significance
  out <- wp.regression(p1 = 13, p2 = 9, f2 = effect, alpha = 0.05, power = power)
  return(out$n)
  }

df <- data.frame(Power = power.vec, N1 = sapply(power.vec, Power.func, effect = 0.02)) %>%
  melt(., id.vars = 'Power')

ggplot(df, aes(x = value, y = Power)) +
  theme_classic() +
  geom_line(size = 1) +
  labs(x = 'Sample size') +
  geom_vline(xintercept = df[(df$Power == 0.8) & (df$variable == 'N1'), 'value'],
             linetype = 3, color = 'black', size = 1)
```

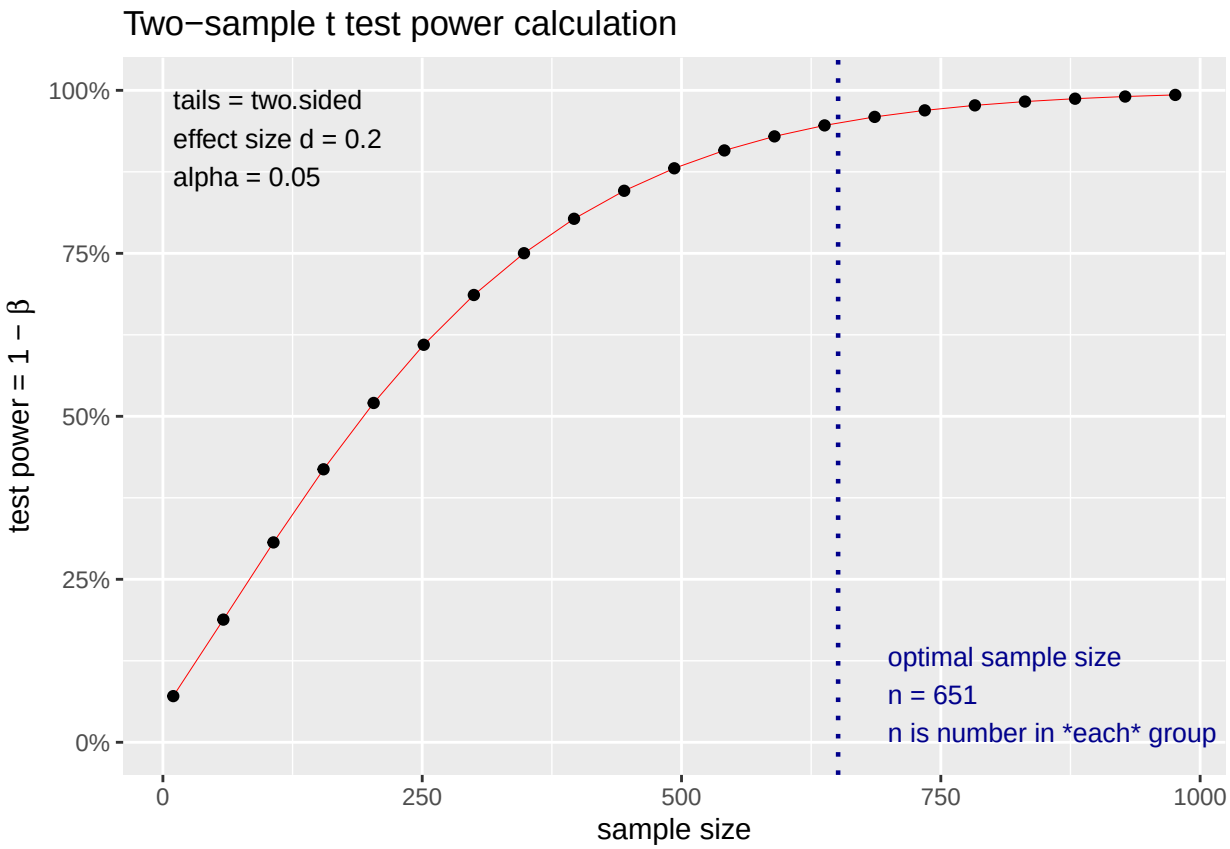


Power as a function of sample size (t-test)

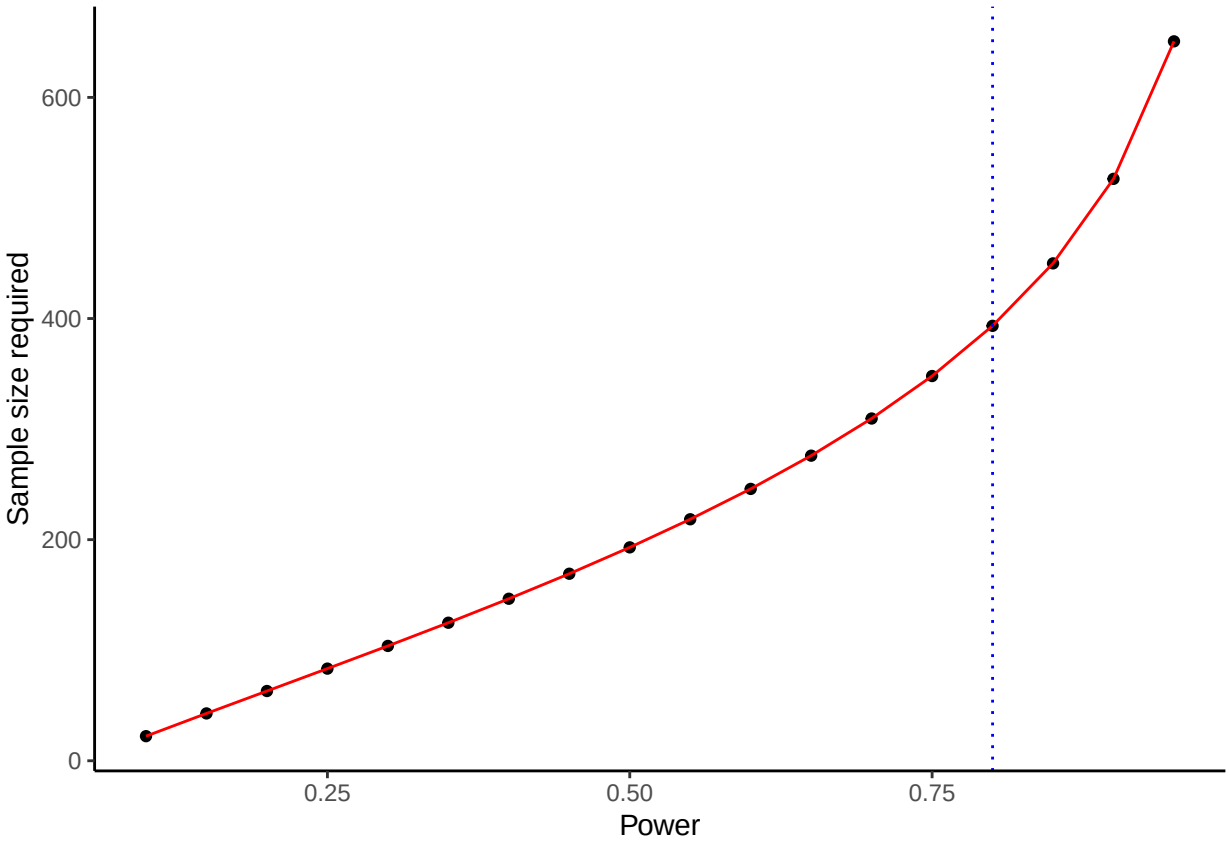
```
p.out.t <- pwr.t.test(d = 0.2, sig.level = 0.05, power = 0.95)
p.out.t
```

```
##
##      Two-sample t test power calculation
##
##               n = 650.6974
##               d = 0.2
##       sig.level = 0.05
##           power = 0.95
##     alternative = two.sided
##
## NOTE: n is number in *each* group
```

```
plot(p.out.t)
```




```
power.vec <- seq(0.1, 0.95, 0.05)

data.frame(Power = power.vec, N = sapply(power.vec, function (x) pwr.t.test(d = 0.2, sig.level = 0.05, p
  ggplot(., aes(x = Power, y = N)) +
  geom_point() +
  theme_classic() +
  geom_line(color = 'red') +
  labs(y = 'Sample size required') +
  geom_vline(xintercept = 0.8, linetype = 3, color = 'blue')
```


Sample size required
600
400
200
0
0.25
0.50
0.75
Power