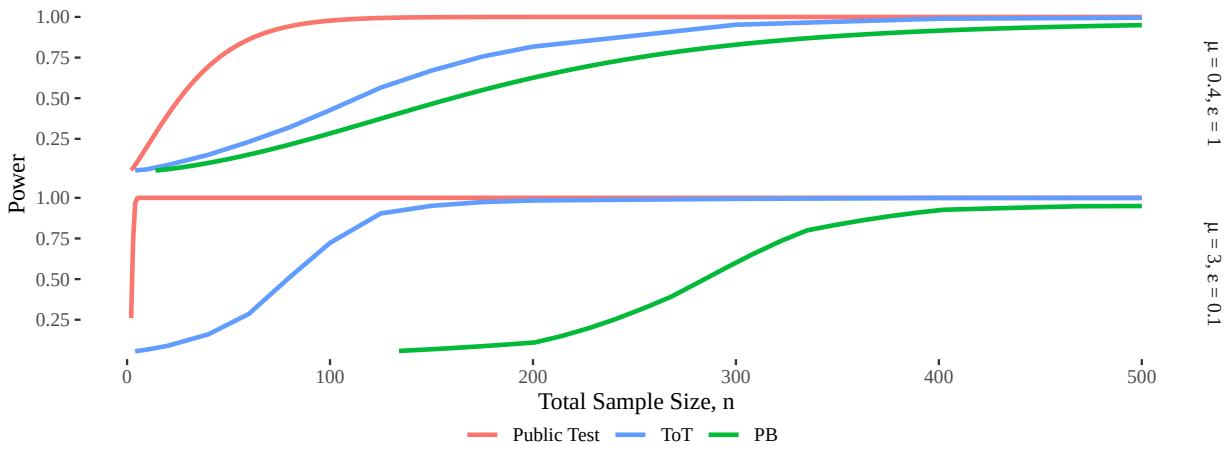
Figures from ICML Version of Paper

The code in this document creates the plots in the text of the ArXiv version of the paper (as of March 2023) using the saved power computations in the `figures` folder.

The following creates Figure 2 comparing ToT to PB.

```
Figure_2 <- read_csv("figures_data/Figure_2.csv", show_col_types = FALSE)

Figure_2 %>%
  # Adjust Order of Tests in Legend
  mutate(test = factor(test, levels = c("Public Test", "ToT", "PB"))) %>%
  # Create a Variable of Facet Labels
  mutate(eff = paste0("mu*' = ", eff,", '*epsilon*' = ", eps,"'")) %>%
  ggplot(aes(x = n, y = power, color = test)) +
  geom_line(linewidth =  1) +
  facet_grid(rows = vars(eff), labeller = label_parsed) +
  scale_color_manual(values = plot_colors[c(1,5,3)]) +
  labs(x = "Total Sample Size, n", y = "Power", color = "") +
  theme_tufte() +
  theme(legend.position="bottom", legend.margin=margin(-10,0,0,-20))
```

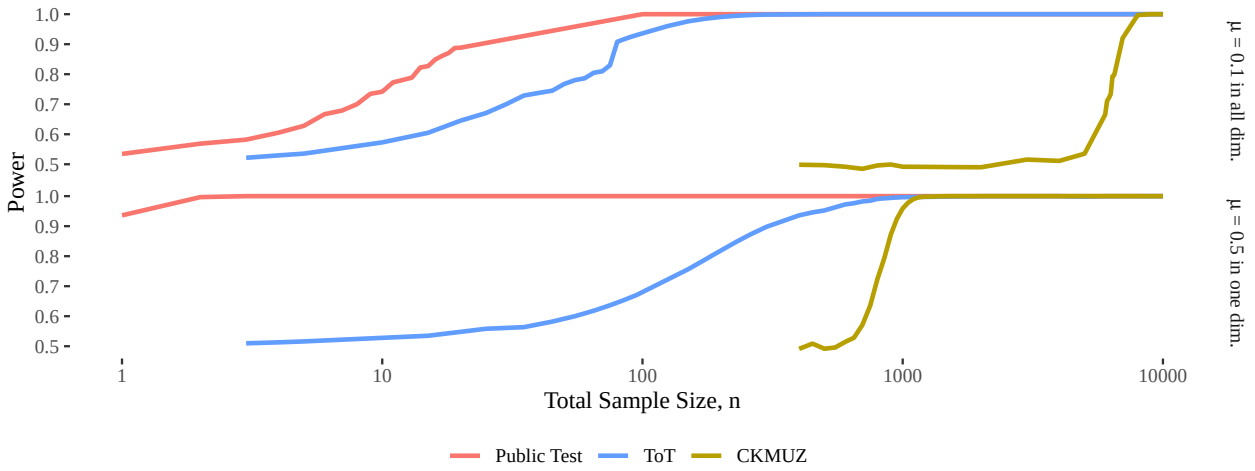



```
ggsave("ICML_plots/Fig2.pdf", width = 3.25, height = 4,
       dpi=600, units = "in", device = "pdf")
```

The following creates Figure 3 comparing ToT to CKMUZ.

```
Figure_3 <- read_csv("figures_data/Figure_3.csv", show_col_types = FALSE)

Figure_3 %>%
  # Adjust Order of Tests in Legend
```

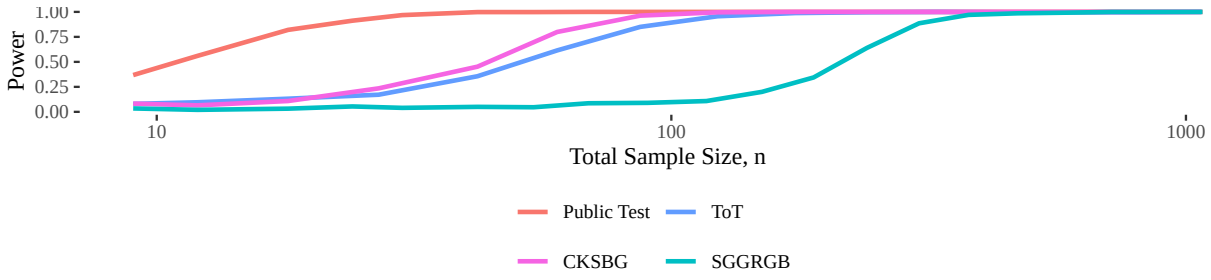
```
  mutate(test = factor(test, levels = c("Public Test", "ToT", "CKMUZ"))) %>%
  # Create a Variable of Facet Labels
  mutate(eff = case_when(eff == 0.5 ~ "mu*' = 0.5 in one dim.'",
                         eff == 0.1 ~ "mu*' = 0.1 in all dim.'")) %>%
  ggplot(aes(x = n, y = power, color = test)) +
  geom_line(linewidth =  1) +
  facet_grid(rows = vars(eff), labeller = label_parsed) +
  labs(x = "Total Sample Size, n", y = "Power", color = "") +
  scale_x_log10() + theme_tufte() +
  scale_color_manual(values = plot_colors[c(1,5,2)]) +
  theme(legend.position="bottom", legend.margin=margin(0,0,0,-20),
        plot.margin=grid::unit(c(0,0,0,0), "mm"))
```




```
ggsave("ICML_plots/Fig3.pdf", width = 3.25, height = 4,
       dpi=600, units = "in")
```

The following creates Figure 4 comparing ToT to CKSBG and SGGRGB.

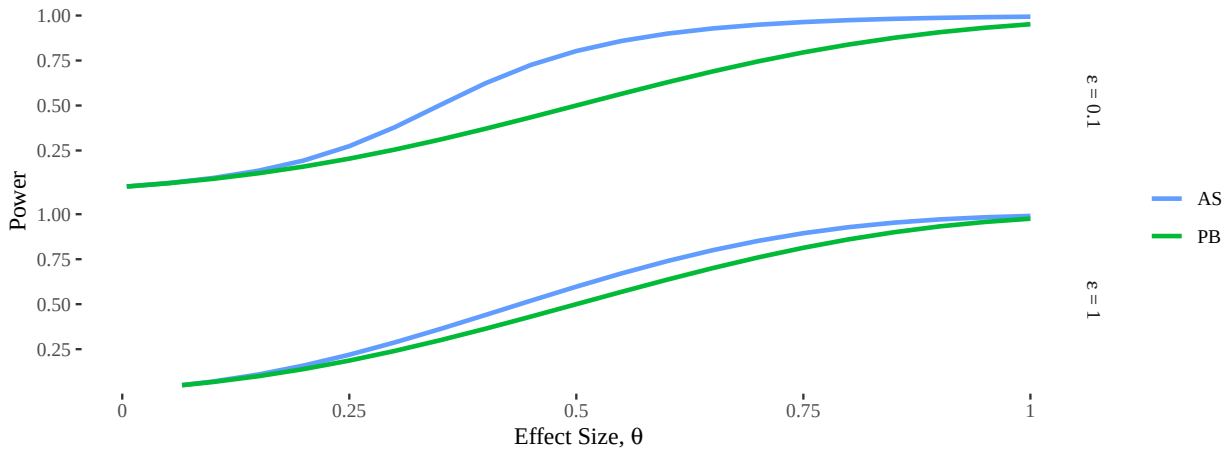
```
Figure_4 <- read_csv("figures_data/Figure_4.csv", show_col_types = FALSE)

Figure_4 %>%
  # Adjust Order of Tests in Legend
  mutate(test = factor(test, levels = c("Public Test", "ToT",
                                        "CKSBG", "SGGRGB"))) %>%
  ggplot(aes(x = n, y = power, color = test)) + geom_line(linewidth =  1) +
  labs(x = "Total Sample Size, n", y = "Power", color = "") +
  scale_x_log10() + theme_tufte() +
  scale_color_manual(values = plot_colors[c(1,5,6,4)]) +
  theme(legend.position="bottom", legend.margin=margin(0,0,0,-20),
      plot.margin=grid::unit(c(0,0,0,0), "mm")) +
  guides(color=guide_legend(nrow=2, byrow=TRUE))
```




```
ggsave("ICML_plots/Fig4.pdf", width = 3.25, height = 2.75,
       dpi=600, units = "in")
```

The following creates Figure 5 in the appendix comparing AS to PB.

```
Figure_5 <- read_csv("figures_data/Figure_5.csv", show_col_types = FALSE)

Figure_5 %>%
  mutate(epsilon = paste0("epsilon*' = ", eps,"'")) %>%
  mutate(test = case_when(test == "Awan & Slavkovic" ~ "AS",
                          test == "Pena & Barrientos" ~ "PB")) %>%
  ggplot(aes(x = theta, y = power, color = test)) +
  geom_line(linewidth =  1) +
  facet_grid(rows = vars(epsilon), labeller = label_parsed) +
  labs(x = expression("Effect Size, "*theta), color = "", y = "Power") +
  scale_color_manual(values = plot_colors[c(5,3)]) +
  scale_x_continuous(labels = c(0, 0.25, 0.5, 0.75, 1)) +
  theme_tufte()
```

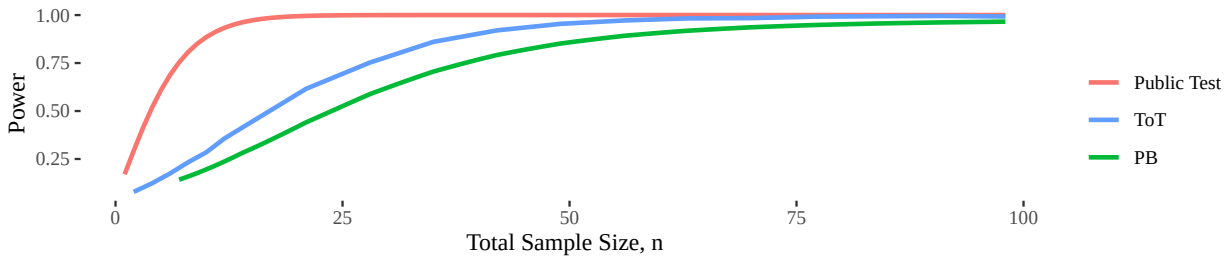



```
ggsave("ICML_plots/Fig5.pdf", width = 6.75, height = 1.75*2,
       dpi=600, units = "in")
```

The following creates Figures 6-7 in the appendix comparing ToT to PB.

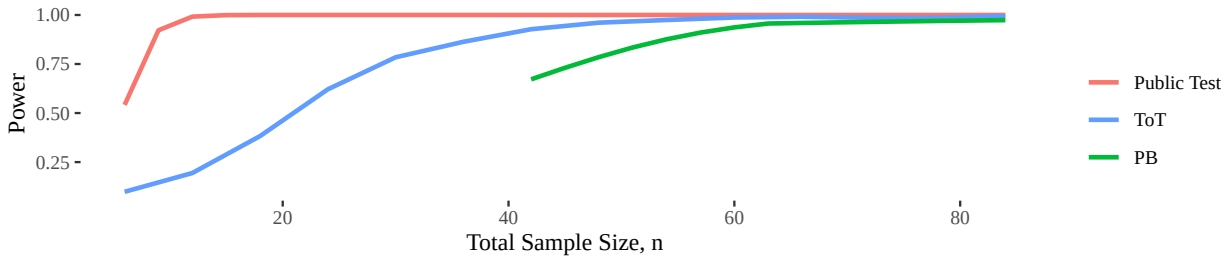
```
Figure_6 <- read_csv("figures_data/Figure_6.csv", show_col_types = FALSE)

Figure_6 %>%
```

```
  mutate(test = case_when(test == "Public" ~ "Public Test",
                          test == "PB" ~ "PB",
                          test == "ToT" ~ "ToT")) %>%
  mutate(test = factor(test, levels = c("Public Test", "ToT", "PB"))) %>%
  ggplot(aes(x = n, y = power, color = test)) +
  geom_line(linewidth =  1) +
  scale_color_manual(values = plot_colors[c(1,5,3)]) +
  labs(x = "Total Sample Size, n", y = "Power", color = "") +
  theme_tufte()
```




```
ggsave("ICML_plots/Fig6.pdf", width = 6.75, height = 1.75,
       dpi=600, units = "in")
```

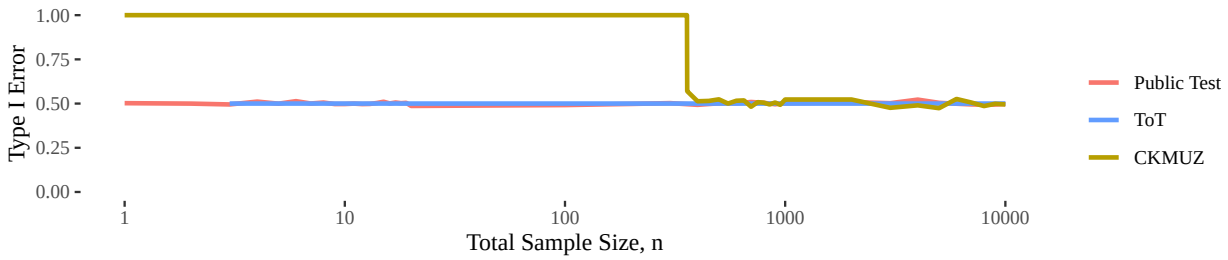
```
Figure_7 <- read_csv("figures_data/Figure_7.csv", show_col_types = FALSE)

Figure_7 %>%
  mutate(test = case_when(test == "Public" ~ "Public Test",
                          test == "PB" ~ "PB",
                          test == "ToT" ~ "ToT")) %>%
  mutate(test = factor(test, levels = c("Public Test", "ToT", "PB"))) %>%
  ggplot(aes(x = n, y = power, color = test)) +
  geom_line(linewidth =  1) +
  scale_color_manual(values = plot_colors[c(1,5,3)]) +
  labs(x = "Total Sample Size, n", y = "Power", color = "") +
  theme_tufte()
```




```
ggsave("ICML_plots/Fig7.pdf", width = 6.75, height = 1.75,
       dpi=600, units = "in")
```

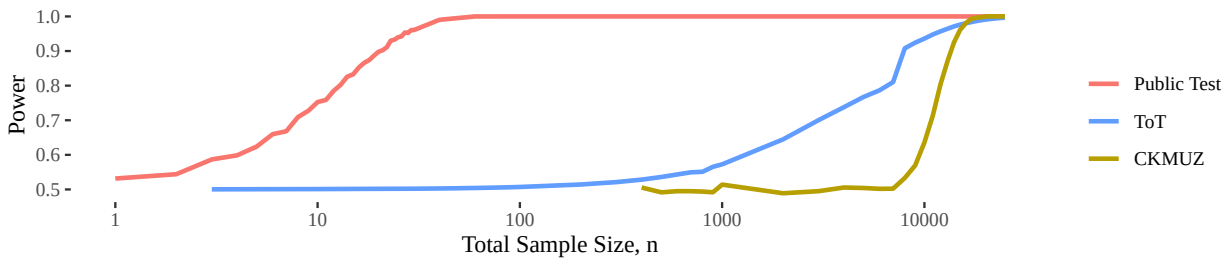
The following creates Figures 8-12 in the appendix comparing ToT to CKMUZ.

```
Figure_8 <- read_csv("figures_data/Figure_8.csv", show_col_types = FALSE)

Figure_8 %>%
  mutate(test = case_when(test == "Public" ~ "Public Test",
                          test == "Canonne" ~ "CKMUZ",
                          test == "Test of tests" ~ "ToT")) %>%
  mutate(test = factor(test, levels = c("Public Test", "ToT", "CKMUZ"))) %>%
  ggplot(aes(x = n, y = power, color = test)) +
  geom_line(linewidth =  1) +
  labs(x = "Total Sample Size, n", y = "Type I Error", color = "") +
  scale_x_log10() + theme_tufte() + ylim(0,1) +
  scale_color_manual(values = plot_colors[c(1,5,2)])
```



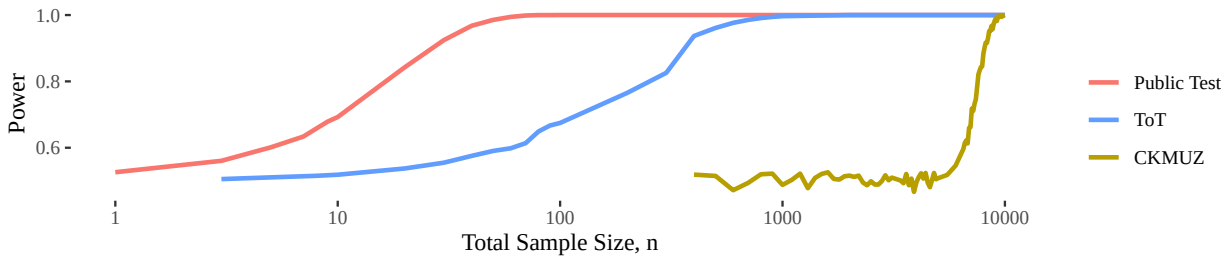

```
ggsave("ICML_plots/Fig8.pdf", width = 6.75, height = 1.75,
       dpi=600, units = "in")
```

```
Figure_9 <- read_csv("figures_data/Figure_9.csv", show_col_types = FALSE)

Figure_9 %>%
  filter(!(test == "Canonne" & n < 359)) %>%
  mutate(test = case_when(test == "Public" ~ "Public Test",
                          test == "Canonne" ~ "CKMUZ",
                          test == "Test of tests" ~ "ToT")) %>%
  mutate(test = factor(test, levels = c("Public Test", "ToT", "CKMUZ"))) %>%
  ggplot(aes(x = n, y = power, color = test)) +
  geom_line(linewidth =  1) +
  labs(x = "Total Sample Size, n", y = "Power", color = "") +
  scale_x_log10() + theme_tufte() +
  scale_color_manual(values = plot_colors[c(1,5,2)])
```



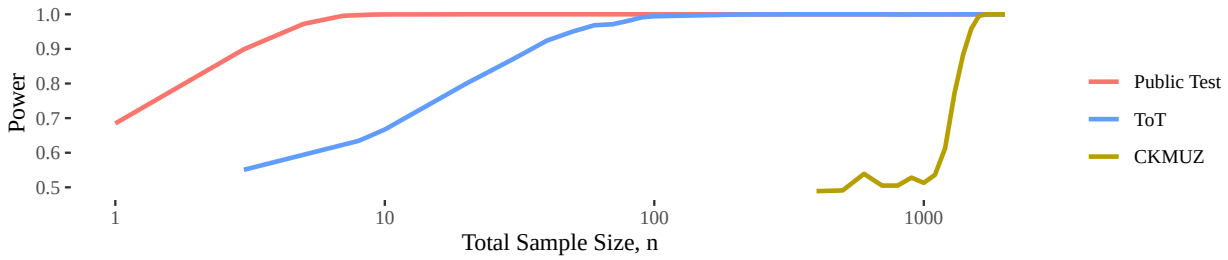

```
ggsave("ICML_plots/Fig9.pdf", width = 6.75, height = 1.75,
       dpi=600, units = "in")
```

```
Figure_10 <- read_csv("figures_data/Figure_10.csv", show_col_types = FALSE)

Figure_10 %>%
  filter(!(test == "Canonne" & n < 359)) %>%
  mutate(test = case_when(test == "Public" ~ "Public Test",
                          test == "Canonne" ~ "CKMUZ",
                          test == "Test of tests" ~ "ToT")) %>%
  mutate(test = factor(test, levels = c("Public Test", "ToT", "CKMUZ"))) %>%
  ggplot(aes(x = n, y = power, color = test)) +
  geom_line(linewidth =  1) +
  labs(x = "Total Sample Size, n", y = "Power", color = "") +
  scale_x_log10() + theme_tufte() +
  scale_color_manual(values = plot_colors[c(1,5,2)])
```



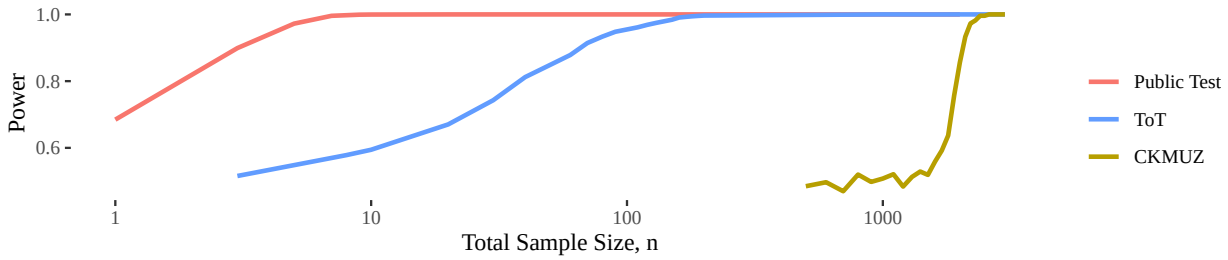

```
ggsave("ICML_plots/Fig10.pdf", width = 6.75, height = 1.75,
       dpi=600, units = "in")
```

```
Figure_11 <- read_csv("figures_data/Figure_11.csv", show_col_types = FALSE)

Figure_11 %>%
  filter(!(test == "Canonne" & n < 359)) %>%
  mutate(test = case_when(test == "Public" ~ "Public Test",
                          test == "Canonne" ~ "CKMUZ",
                          test == "Test of tests" ~ "ToT")) %>%
  mutate(test = factor(test, levels = c("Public Test", "ToT", "CKMUZ"))) %>%
  ggplot(aes(x = n, y = power, color = test)) +
  geom_line(linewidth =  1) +
  labs(x = "Total Sample Size, n", y = "Power", color = "") +
  scale_x_log10() + theme_tufte() +
  scale_color_manual(values = plot_colors[c(1,5,2)])
```



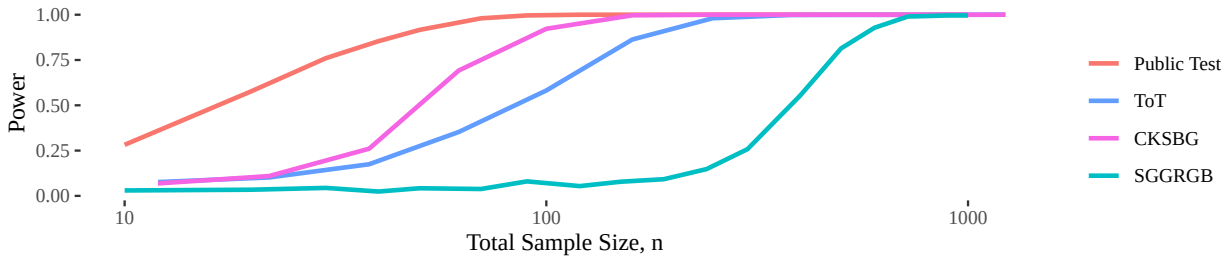
```
ggsave("ICML_plots/Fig11.pdf", width = 6.75, height = 1.75,
       dpi=600, units = "in")
```

```
Figure_12 <- read_csv("figures_data/Figure_12.csv", show_col_types = FALSE)

Figure_12 %>%
  filter(!(test == "Canonne" & n <= 400)) %>%
  mutate(test = case_when(test == "Public" ~ "Public Test",
                          test == "Canonne" ~ "CKMUZ",
                          test == "Test of tests" ~ "ToT")) %>%
  mutate(test = factor(test, levels = c("Public Test", "ToT", "CKMUZ"))) %>%
  ggplot(aes(x = n, y = power, color = test)) +
  geom_line(linewidth =  1) +
  labs(x = "Total Sample Size, n", y = "Power", color = "") +
  scale_x_log10() + theme_tufte() +
  scale_color_manual(values = plot_colors[c(1,5,2)])
```



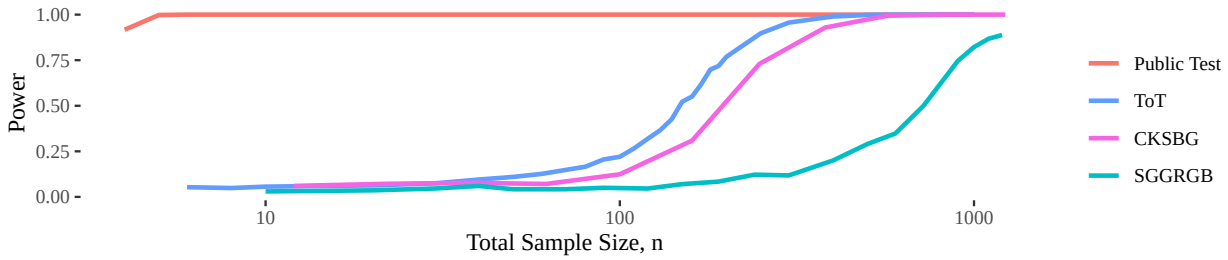

```
ggsave("ICML_plots/Fig12.pdf", width = 6.75, height = 1.75,
       dpi=600, units = "in")
```

```
Figure_13 <- read_csv("figures_data/Figure_13.csv", show_col_types = FALSE)

Figure_13 %>%
  filter(eps == 1, n <= 1226) %>%
  filter(test %in% c("Public ANOVA", "kw abs", "Private ANOVA",
                     "Test of tests")) %>%
  mutate(test = case_when(test == "Public ANOVA" ~ "Public Test",
                          test == "Private ANOVA" ~ "SGGRGB",
                          test == "kw abs" ~ "CKSBG",
                          test == "Test of tests" ~ "ToT")) %>%
  mutate(test = factor(test, levels = c("Public Test", "ToT",
                                        "CKSBG", "SGGRGB"))) %>%
  ggplot(aes(x = n, y = power, color = test)) + geom_line(linewidth =  1) +
  labs(x = "Total Sample Size, n", y = "Power", color = "") +
  scale_x_log10() + theme_tufte() +
  scale_color_manual(values = plot_colors[c(1,5,6,4)])
```




```
ggsave("ICML_plots/Fig13.pdf", width = 6.75, height = 1.75,
       dpi=600, units = "in")
```

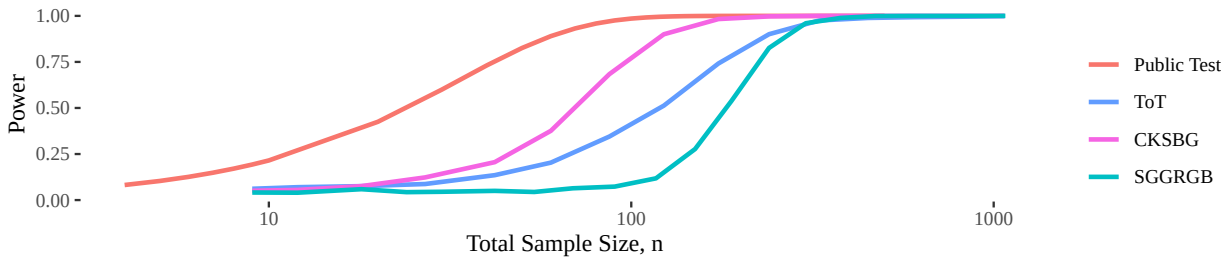
```
Figure_14 <- read_csv("figures_data/Figure_14.csv", show_col_types = FALSE)

Figure_14 %>%
  filter(n <= 1226) %>%
  filter(test %in% c("pub", "Private KW", "Private ANOVA",
                     "Test of tests")) %>%
  mutate(test = case_when(test == "pub" ~ "Public Test",
                          test == "Private ANOVA" ~ "SGGRGB",
                          test == "Private KW" ~ "CKSBG",
                          test == "Test of tests" ~ "ToT")) %>%
  mutate(test = factor(test, levels = c("Public Test", "ToT",
                                        "CKSBG", "SGGRGB"))) %>%
  ggplot(aes(x = n, y = power, color = test)) + geom_line(linewidth =  1) +
  labs(x = "Total Sample Size, n", y = "Power", color = "") +
  scale_x_log10() + theme_tufte() +
  scale_color_manual(values = plot_colors[c(1,5,6,4)])
```




```
ggsave("ICML_plots/Fig14.pdf", width = 6.75, height = 1.75,
       dpi=600, units = "in")
```

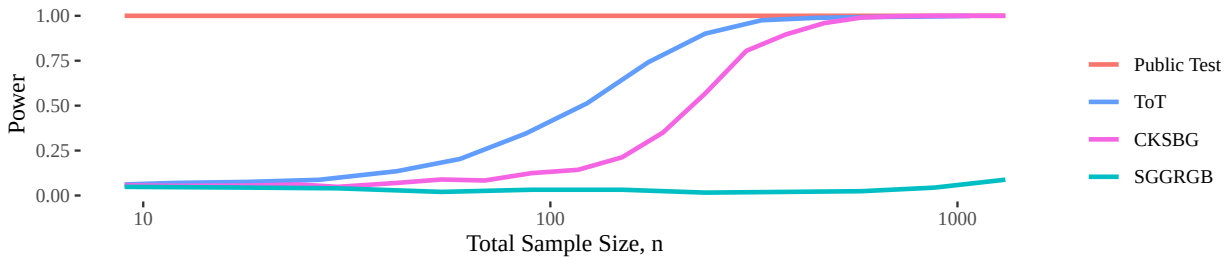
```
Figure_15 <- read_csv("figures_data/Figure_15.csv", show_col_types = FALSE)

Figure_15 %>%
  filter(n <= 1226) %>%
  filter(test %in% c("pub", "Private KW", "Private ANOVA",
                     "Test of tests")) %>%
  mutate(test = case_when(test == "pub" ~ "Public Test",
                          test == "Private ANOVA" ~ "SGGRGB",
                          test == "Private KW" ~ "CKSBG",
                          test == "Test of tests" ~ "ToT")) %>%
```

```
  mutate(test = factor(test, levels = c("Public Test", "ToT",
                                        "CKSBG", "SGGRGB"))) %>%
  ggplot(aes(x = n, y = power, color = test)) + geom_line(linewidth =  1) +
  labs(x = "Total Sample Size, n", y = "Power", color = "") +
  scale_x_log10() + theme_tufte() +
  scale_color_manual(values = plot_colors[c(1,5,6,4)])
```




```
ggsave("ICML_plots/Fig15.pdf", width = 6.75, height = 1.75,
       dpi=600, units = "in")
```

```
Figure_16 <- read_csv("figures_data/Figure_16.csv", show_col_types = FALSE)

Figure_16 %>%
  filter(n <= 1311) %>%
  filter(test %in% c("Public KW", "New KW", "Private ANOVA",
                     "Test of tests")) %>%
  mutate(test = case_when(test == "Public KW" ~ "Public Test",
                          test == "Private ANOVA" ~ "SGGRGB",
                          test == "New KW" ~ "CKSBG",
                          test == "Test of tests" ~ "ToT")) %>%
  mutate(test = factor(test, levels = c("Public Test", "ToT",
                                        "CKSBG", "SGGRGB"))) %>%
  ggplot(aes(x = n, y = power, color = test)) + geom_line(linewidth =  1) +
  labs(x = "Total Sample Size, n", y = "Power", color = "") +
  scale_x_log10() + theme_tufte() +
  scale_color_manual(values = plot_colors[c(1,5,6,4)])
```




```
ggsave("ICML_plots/Fig16.pdf", width = 6.75, height = 1.75,
       dpi=600, units = "in")
```