3. LOG-LOG

$$\log(y) = \beta_0 + \beta_1 \log(x) + u$$

THINK OF A CONSTANT ELASTICITY DEMAND OR SUPPLY CURVE:

$$Q = cP^{\varepsilon} \leftarrow \text{ELASTICITY}$$

LET Y BE Q AND P BE X:

$$y = c\,x^{\varepsilon}$$

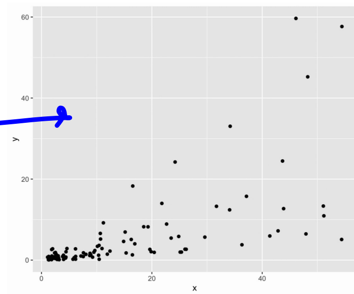
TAKE LOGS:

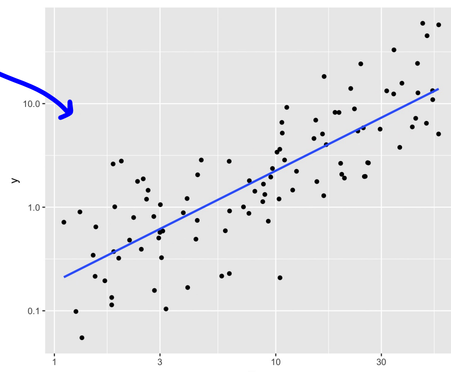
$$\log(y) = \underbrace{\log(c)}_{\beta_0} + \underset{\beta_1}{\varepsilon} \log(x)$$

```r
data_constant_elasticity %>%
  ggplot(aes(x = x, y = y)) +
  geom_point()

data_constant_elasticity %>%
  ggplot(aes(x = x, y = y)) +
  geom_point() +
  geom_smooth(method = lm, se = F) +
  scale_y_log10() +
  scale_x_log10()

data_constant_elasticity %>%
  lm(log(y) ~ log(x), data = .) %>%
  broom::tidy()
```





term	estimate	std.error	statistic	p.value
<chr>	<dbl>	<dbl>	<dbl>	<dbl>
(Intercept)	-1.66	0.195	-8.52	1.94e-13
log(x)	1.07	0.0809	13.3	1.30e-23

$\hat{\beta}_0 = -1.66$: EXPECTED VALUE OF $\log(y)$ WHEN $\log(x) = 0$ (OR WHEN $x = 1$).

$\hat{\beta}_1 = 1.07$ IS AN ELASTICITY, SO ITS INTERPRETATION: WHEN X INCREASES BY 1%, Y IS EXPECTED TO INCREASE BY 1.07%.