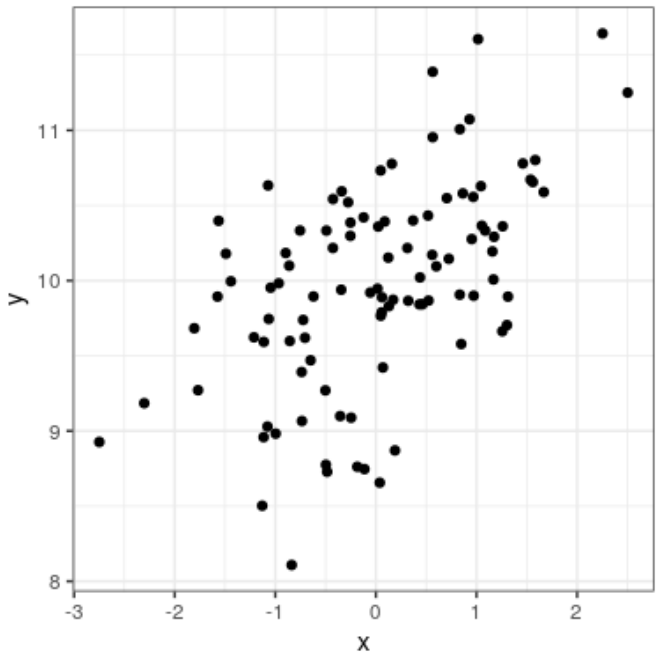
27.1: Linear Regression (Section 26.1)

To perform linear regression in R, we use the `lm()` function. Let's generate some data and use this function to compute the linear regression solution.

```
npoints <- 100
intercept = 10
# slope of X/Y relationship
0.5slope=
# this lets us control the strength of the relationship
# by varying the amount of noise added to the y variable
0.6noise_sd =

regression_data <- tibble(x = rnorm(npoints)) %>%
  mutate(y = x*slope + rnorm(npoints)*noise_sd + intercept)

ggplot(regression_data,aes(x,y)) +
  geom_point()
```



We can then apply `lm()` to these data:

```
lm_result <- lm(y ~ x, data=regression_data)
summary(lm_result)
```

```
##
## Call:
## lm(formula = y ~ x, data = regression_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.5563 -0.3042 -0.0059  0.3804  1.2522
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   9.9761     0.0580  172.12  < 2e-16 ***
## x             0.3725     0.0586    6.35  6.6e-09 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.58 on 98 degrees of freedom
## Multiple R-squared:  0.292,  Adjusted R-squared:  0.284
## F-statistic: 40.4 on 1 and 98 DF,  p-value: 6.65e-09
```

We should see three things in the `lm()` results:

- The estimate of the Intercept in the model should be very close to the intercept that we specified
- The estimate for the x parameter should be very close to the slope that we specified
- The residual standard error should be roughly similar to the noise standard deviation that we specified

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