5.) (a) Train: Expect QDA to perform better, b/c more parms in QDA will overfit and have smaller train MSE.

Test: Expect LDA to perform better, as QDA will likely overfit, and have too large variance making its MSE $\gg$ MSE$_{LDA}$.

(b) Train: Expect QDA to perform better b/c more parms fits data closer.

Test: Expect QDA to perform better b/c more parms allows it to better fit complex non-linear form.

(c) In general, expect test prediction of QDA to improve relative to LDA, because QDA fits more parms, so larger sample size will benefit QDA more dramatically than LDA as QDA variace will decrease rapidly initially.

(d). False. while QDA is $\overset{more}{flexible}$, it is constrained to using more parms than LDA. So when truth is linear, it uses more parms to model simple linear shape, (LDA does this using fewer parms), thus QDA overfits and has larger MSE than LDA b/c of much higher variance. Expect LDA to have smaller test error rate.

6.) (a) $\log\left(\frac{Y}{1-Y}\right) = \beta_0 + \beta_1 \cdot X_1 + \beta_2 \cdot X_2 = -6 + (0.05)(40) + (1)(3.5) = -0.5$

$\hat{y} = \frac{e^{\hat{\beta}X}}{1+e^{\hat{\beta}X}} = \frac{e^{-0.5}}{1+e^{-0.5}} = \boxed{0.3775} \checkmark$

(b) $\hat{y} = 0.5 \Rightarrow \ln\left(\frac{0.5}{0.5}\right) = 0 \Rightarrow 0 = -6 + (0.05)X_1 + (1)(3.5) \Rightarrow$

$\boxed{X_1 = 50 \text{ hours}} \checkmark$