Part I

1. $\log(odds(HeartAttack)) = -7.98 + 0.0731[MAP] - 0.0112[Cholesterol] \rightarrow$
   $odds(HeartAttack) = e^{-7.98+0.0731[MAP]-0.0112[Cholesterol]} \rightarrow$
   $P(HeartAttack = 1) = \frac{1}{1+e^{7.98-0.0731[110]+0.0112[170]}}$ (page 113 ch. 13.2)
   $= \mathbf{0.137}$

2. $P(HeartAttack = 1) = \frac{1}{1+e^{7.98-0.0731[110]+0.0112[171]}} = 0.135$
   a. A 1 mg/dL increase decreases the probability of a heart attack by 0.002

3. $0.50 = \frac{1}{1+e^{7.98-0.0731[MAP]+0.0112[Cholesterol]}} \rightarrow$
   $\log\left(\frac{1}{0.50} - 1\right) = \log(e^{7.98-0.0731[MAP]+0.0112[Cholesterol]}) \rightarrow$
   $0 = 7.98 - 0.0731[MAP] + 0.0112[Cholesterol] \rightarrow$
   $[\mathbf{Cholesterol}] = \mathbf{6.527}[\mathbf{MAP}] - \mathbf{712.5}$

   Example solutions $(MAP, Cholesterol): (120, 70.7), (150, 266.6), (200, 592.9)$

Part II

1.
Code
```
clear; close all; clc;
load 'cas9.mat'
model = fitglm(cas9, 'Success ~ ProtospacerSize + WrongPAM + Methylation +
Mismatches', 'link', 'logit', 'Distribution', 'binomial')
```
Output:
```
model =


Generalized linear regression model:
    logit(Success) ~ 1 + ProtospacerSize + WrongPAM + Methylation + Mismatches
    Distribution = Binomial

Estimated Coefficients:
                     Estimate      SE        tStat       pValue

                     _____    _____    _____    _____

    (Intercept)      -19.909     11.008     -1.8085     0.070524
    ProtospacerSize   0.99151    0.56156     1.7656     0.077458
    WrongPAM         -1.1456      0.5717    -2.0038      0.04509
    Methylation       0.71697    0.55853     1.2837      0.19926
    Mismatches       -2.9309     1.0858     -2.6992     0.0069501


100 observations, 95 error degrees of freedom
Dispersion: 1
Chi^2-statistic vs. constant model: 21.9, p-value = 0.000214
```

2. WrongPAM and Mismatches both have p-values < 0.05 suggesting their coefficients are significantly nonzero and will therefore have an effect on Cas9 cleavage.
3. Odds ratios
   a. WrongPAM: $\exp(-1.1456) = 0.318$
   b. Mismatches: $\exp(-2.9309) = 0.053$