

Instructions: Show all work. Some problems will instruct you to complete operations by hand, some can be done in the calculator. To show work on calculator problems, show the commands you used, and the resulting matrices. **Give exact answers** (yes, that means fractions, square roots and exponentials, and not decimals) unless specifically directed to give a decimal answer. This will require some operations to be done by hand even if not specifically directed to. Be sure to complete all parts of each question.

1. Consider the data in set below. Find the regression equation of the form $y = \beta_0 + \beta_1x$, with caffeine level as x , that best fits the data. Then graph the data in a scatterplot and the resulting linear equation. How good a fit does there appear to be (strong, moderate or weak)?

```
beehive=> select * from CaffeineIQ
caffeine | iq
```

50	100
60	102
80	107
90	105
110	112
150	103
150	108
160	109
180	109
200	112
200	120
210	118
210	114
220	120
220	121
250	130
260	127
260	131
280	132
300	135

$$(ATA)^{-1}AT\vec{y} = \vec{x}$$

$A =$

1	50
1	60
1	80
1	90
1	110
1	150
1	150
1	160
1	180
1	200
1	200
1	210
1	210
1	220
1	220
1	250
1	260
1	280
1	300

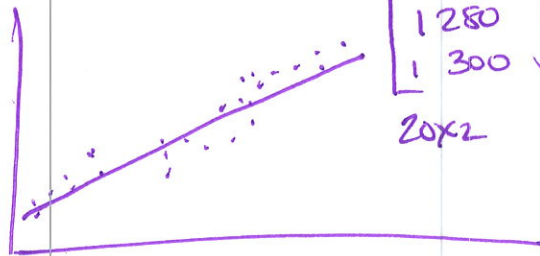
20×2

$\vec{y} =$

100
102
107
105
112
103
108
109
109
112
120
118
114
120
121
130
127
131
132
135

20×1

$$(ATA)^{-1}AT\vec{y} = \begin{bmatrix} 91.308 \\ .1343 \end{bmatrix}$$



$$y = 91.308 + .1343x$$

Strong-moderate fit