Question 1

(a) Suppose that $p_1/p_2 = 1/3$ and that $(6, 10)$ is on the budget line. Then

$$\boxed{\mathbf{(0, 12), (12, 8), \text{ and } (36, 0)}}$$

are also on the budget line. (*Fill in the missing numbers*) *6 points*

(b) See the green budget line below. The intercepts are $(28, 0)$ and $(0, 21)$. Since income is 162, this implies $p_1 = 162/28$ and $p_2 = 162/21$, i.e., *6 points*

$$\boxed{\boldsymbol{p_1 = 5.79,\ p_2 = 7.71}}$$

You can use the grid below to help you find the answers.

Question 2 The following points are on the budget line

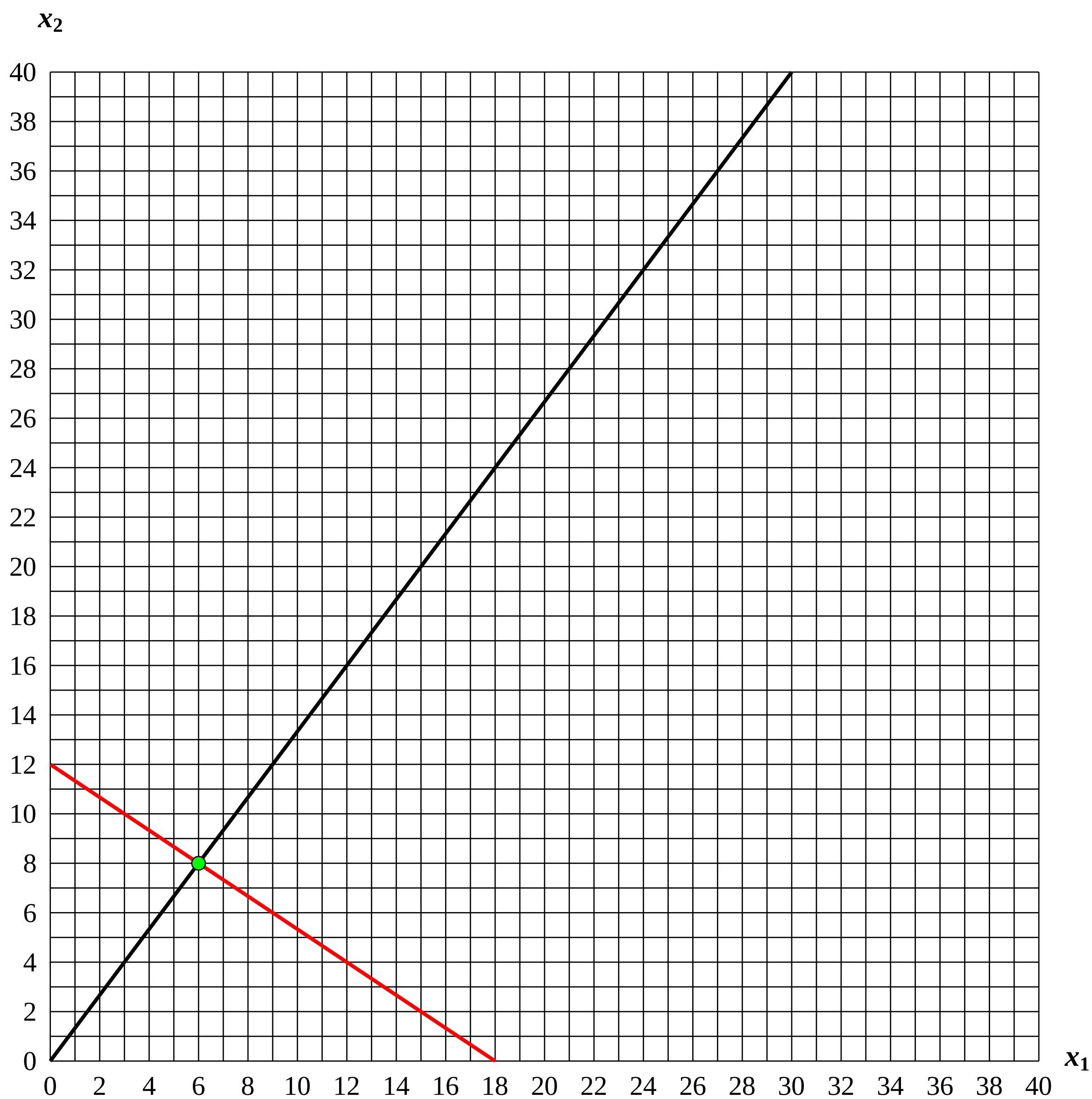
$$\boxed{\mathbf{(0, 115), (10, 65), (30, 60), \text{ and } (270, 0)}}$$

(*Fill in the missing numbers*) *8 points*

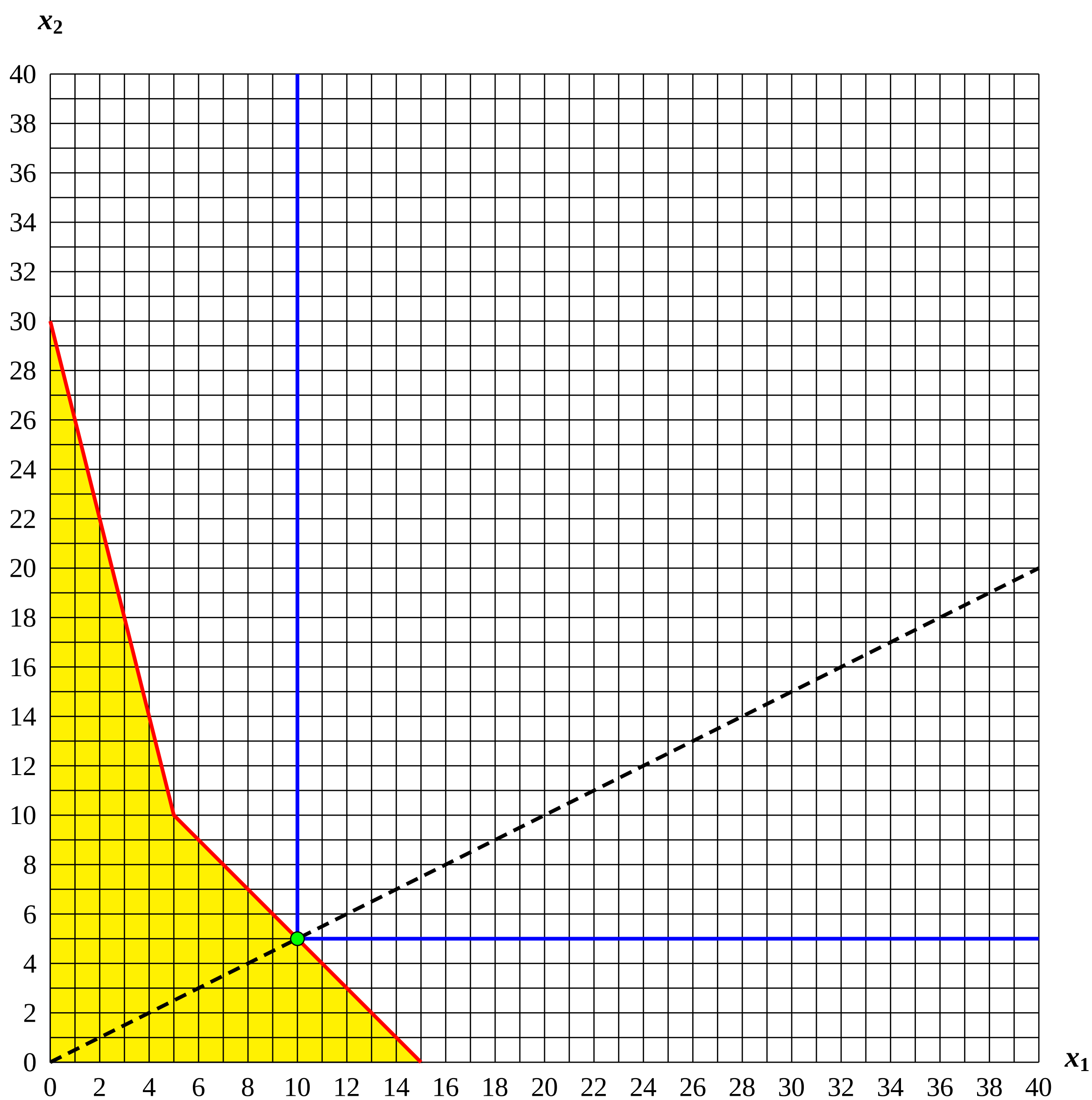
The slope of the budget line is $\boxed{\mathbf{-5}}$ when $x_1 < 10$, and $\boxed{\mathbf{-1/4}}$ when $x_1 > 10$. *4 points*

Question 3 Note that $\frac{\partial u(x_1,x_2)}{\partial x_1} = x_2^2$ and $\frac{\partial u(x_1,x_2)}{\partial x_2} = 2x_1x_2$. Thus, MRS $= 2x_2/x_1$. The equation of the income offer curve is therefore $x_2/(2x_1) = 2/3$, i.e., $x_2 = (4/3)x_1$.

1. Compute the income offer curve and graph it in the grid below. *6 points*
2. Now suppose that the person's income is $m = 36$. Graph the budget line in the grid below. *3 points*
3. Thus, the optimal consumption is $\boxed{x_1 = 6,\ x_2 = 8}$ *3 points*



Question 4 The optimal consumption is $\boxed{\mathbf{x_1 = 10, x_2 = 5.}}$ *14 points*



Question 5

1. $\frac{\partial u(x_1,x_2)}{\partial x_1} = 4x_1x_2$ and $\frac{\partial u(x_1,x_2)}{\partial x_2} = x_1^4$.
   Thus, *6 points*

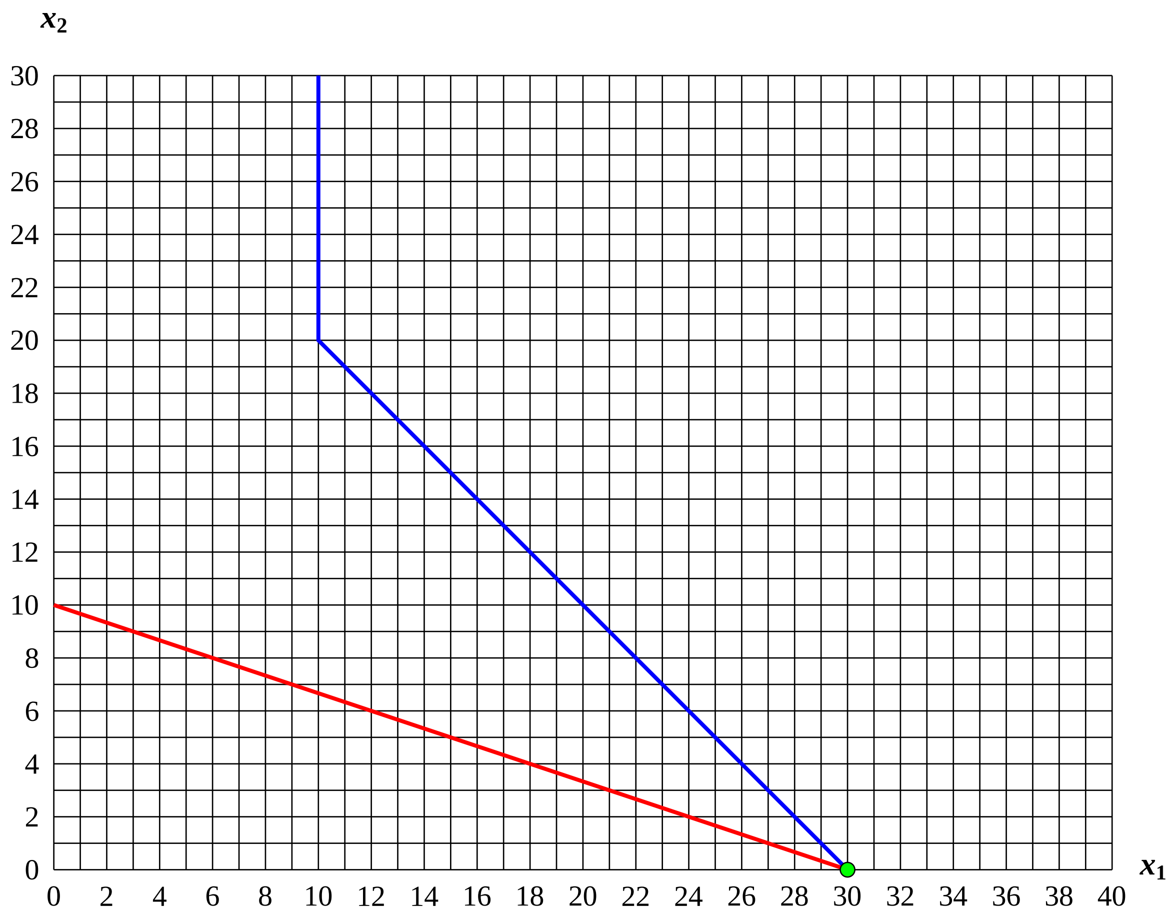
$$\boxed{\mathbf{MRS} = \frac{4x_2}{x_1}}$$

2. $\frac{\partial u(x_1,x_2)}{\partial x_1} = (-1/2)(x_1^{-2} + 2x_2^{-2})^{-3/2}(-2)(3)(x_1)^{-3}$ and $\frac{\partial u(x_1,x_2)}{\partial x_2} = (-1/2)(x_1^{-2} + 2x_2^{-2})^{-3/2}(-2)(x_2)^{-3}$. Then *6 points*

$$\boxed{\mathbf{MRS} = \frac{3x_2^3}{x_1^3}}.$$

Question 6 The equation of the income offer curve is MRS $= \frac{x_2^2}{x_1^2} = 9$. Thus, $x_2 = 3x_1$. The budget line equation is $9x_1 + x_2 = 240$. Thus, $12x_1 = 240$ and hence $x_1 = 20$ and $x_1 = 60$. Then the optimal consumption is $\boxed{\mathbf{x_1 = 20, x_2 = 60.}}$ *14 points*

Question 7 At prices $p_1 = 1$, $p_2 = 4$ and income m, the optimal consumption is on this indifference curve. Then the optimal consumption is $\boxed{\mathbf{x_1 = 30\ , x_2 = 0}}$, and income is $\boxed{\mathbf{m = 30}}$. *12 points*



Question 8 His utility function is given by $u(x_1, x_2) = 14x_1 - x_1^2 + x_2$. Thus, MRS $= 14 - 2x_1$.

(a) Suppose the price of a ride is $p = 2$. Then $14 - 2x_1 = 2$. Thus, he will take $\boxed{\mathbf{x_1 = 6}}$ rides and spend $\boxed{\mathbf{\$\ 12}}$ at the park. *4 points*

(b) Since $p = 0$, we get $0 = 14 - 2x_1$. Thus, the person will take $\boxed{\mathbf{x_1 = 7}}$ rides. *4 points*

(c) (*Difficult*) The utility from not going to the park is m, where m is the person's income. Given the result from (b), the utility of going to the park is $98 - 49 + m - F$. Thus, at the maximum F we have $49 + m - F = m$. Hence,

Determine the maximum entry fee F a person with the above preferences would be willing to pay to enter the park (if the person does not pay F then he cannot enter the park and $x_1 = 0$). Thus, $\boxed{\mathbf{F = 49}.}$ *4 points*