**Production problems**

1. A firm’s product sells for $2 per unit in a highly competitive market. The firm produces output using capital (which is rented at $75 per hour) and labor (which is paid a wage of $15 per hour under a contract for 20 hours of labor services). Complete the following table and use the information to answer the questions that follow.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **K** | **L** | **Q** | **MPK** | **APK** | **VMPK** |
| 0 | 20 | 0 |  |  |  |
| 1 | 20 | 50 |  |  |  |
| 2 | 20 | 150 |  |  |  |
| 3 | 20 | 300 |  |  |  |
| 4 | 20 | 400 |  |  |  |
| 5 | 20 | 450 |  |  |  |
| 6 | 20 | 475 |  |  |  |
| 7 | 20 | 475 |  |  |  |
| 8 | 20 | 450 |  |  |  |
| 9 | 20 | 400 |  |  |  |
| 10 | 20 | 300 |  |  |  |
| 11 | 20 | 150 |  |  |  |

(a) Identify the fixed and variable inputs

(b) What are the firm's fixed costs?

(c) What is the variable cost of producing 475 units of output?

(d) How many units of the variable input should be used to maximize profits?

(e) What are the maximum profits this firm can earn?

(f) Over what range of the variable input usage do increasing marginal returns exist?

(g) Over what range of the variable input usage do decreasing marginal returns exist?

(h) Over what range of the variable input usage do negative marginal returns exist?

2. A manager hires labor and rents capital equipment in a very competitive market. Currently the wage rate is $6 per hour and capital is rented at $12 per hour. If the marginal product of labor is 50 units of output per hour and the marginal product of capital is 75 units of output per hour, is the firm using the cost-minimizing combination of labor and capital? If not, should the firm increase or decrease the amount of capital used in its production process?