Make Sure to check second order conditions for all solutions
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) A monopolist produces two products, $A$, and $B$. The joint-cost function is $c=5 q_{A}+3 q_{B}+5000$ $\qquad$ where $c$ is the total cost of producing $q_{A}$ units of $A$ and $q_{B}$ units of $B$. the demand functions for these products are given by $p_{A}=205-2 q_{A}-q_{B}$ and $p_{B}=153-q_{A}-q_{B}$, where $p_{A}$ and $p_{B}$ are the prices of $A$ and $B$, respectively. The number of units of $A$ and the number of units $B$ that should be sold to maximize the monopolist's profit is
A) 75 units of $A$ and 100 units of $B$.
B) 15 units of $A$ and 25 units of $B$.
C) 50 units of $A$ and 75 units of $B$.
D) 10 units of $A$ and 15 units of $B$.
E) 25 units of $A$ and 50 units of $B$.

## SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

2) Determine the critical points of $f(x, y)=3 x^{2}+4 y^{2}-2 x+8 y$ and also determine by the second-derivative test whether each point corresponds to a relative maximum, to a relative minimum, to neither, or whether the test gives no information.
3) Determine the critical points of $f(x, y)=4 x^{2}+2 x-y^{2}+2 y$ and also determine by the second-derivative test whether each point corresponds to a relative maximum, to a relative minimum, to neither, or whether the test gives no information.
4) Determine the critical points of $f(x, y)=2 x y-3 x-y-x^{2}-3 y^{2}$ and also determine by the second-derivative test whether each point corresponds to a relative maximum, to a relative minimum, to neither, or whether the test gives no information.
5) Determine the critical points of $f(x, y)=x^{2}+2 x y+2 y^{2}-4 y$ and also determine by the second-derivative test whether each point corresponds to a relative maximum, to a relative minimum, to neither, or whether the test gives no information.
6) Determine the critical points of $f(x, y)=x^{3}+\frac{1}{2} y^{2}-3 x y-4 y+2$ and also determine by the second-derivative test whether each point corresponds to a relative maximum, to a relative minimum, to neither, or whether the test gives no information.
7) A manufacturer produces products $A$ and $B$ for which the average costs of production are constant at 3 and 5 (dollars per unit), respectively. The quantities $q_{A^{\prime}} q_{B}$ of $A$ and $B$ that can be sold each week are given by the joint-demand functions $\begin{gathered}q_{A}=10-p_{A}+p_{B}{ }^{\prime} \\ q_{B}=12+p_{A}-3 p_{B}{ }^{\prime \prime}\end{gathered}$ where $p_{A}$ and $p_{B}$ are the prices (in dollars per unit) of $A$ and $B$, respectively. Determine the prices of $A$ and $B$ at which the manufacturer can maximize profit.
8) Determine all of the critical points of $f(x, y)=x^{3}+3 x^{2}-9 x+y^{3}-12 y$. Also use the second derivative test to determine, if possible, whether a maximum, minimum or saddle point occurs at each of these critical points.
9) Determine all of the critical points of $f(x, y)=\frac{1}{3} x^{3}+x^{2}-3 x+\frac{1}{3} y^{3}-4 y$. Also use the second derivative test to determine, if possible, whether a maximum, minimum or saddle point occurs at each of these critical points.
10) A television manufacturing company makes two types of TV's. The cost of producing $x$
11) $\qquad$
12) $\qquad$ units of type $A$ and $y$ units of type $B$ is given by the function $C(x, y)=100+x^{3}+64 y^{3}-$ $96 x y$. How many units of type $A$ and type $B$ televisions should the company produce to minimize its cost?
