



Name _____ Class _____ Date _____

AFTER THIS WORKSHEET YOU CAN

- ✓ Maximize or minimize with derivatives. ✓ Solve budget-constrained problems.
- ✓ Distinguish constrained from unconstrained problems. ✓ Interpret optimal values.

 Section A · Concept Check • BEGINNER $4 \times 1 = 4$ _____

- 1** $P(x) = -3x^2 + 120x - 200$ is maximized at $x =$:

☐ A. 20 ☐ B. 40 ☐ C. 10 ☐ D. 120

3 A \$500 budget with items at \$25 each buys at most:

☐ A. 20 ☐ B. 25 ☐ C. 12 ☐ D. 50

2 The maximum profit $P(20)$ is:

☐ A. 1000 ☐ B. 2400 ☐ C. 200 ☐ D. 1200

4 Optimization with additional limits is called:

☐ A. unconstrained ☐ B. constrained ☐ C. linear

☐ D. unbounded

 Section B · Problem Solving • INTERMEDIATE $2 + 3 \times 3 = 11$ _____

- 5** Set $P'(x) =$ _____ to find candidates.
- 6** $P'(x) = -6x + 120 = 0$ gives $x =$ _____
- 7** For $P(x) = -3x^2 + 120x - 200$, find the x that maximizes P .
- _____
- 8** Using the previous result, find the maximum profit.
- _____
- 9** A budget of \$500 allows items at \$25 each. Find the maximum quantity.
- _____

 Section C · Challenge • CHALLENGE 5 _____

- 10** What is the difference between unconstrained and constrained optimization?
- _____

 Reflection — the most useful thing I learned: _____
A ___/4 B ___/11 C ___/5 **Total ___/20**

Teacher's Signature _____

Parent's Signature _____

✂ ANSWER KEY — FOLD OR CUT BEFORE HANDING OUT

1-A 2-A 3-A 4-B | 5 0 6 20 7 = $x = 20$ 8 = $P(20) = 1000$ 9 = 20 items | 10 =

Constrained must satisfy additional limits; unconstrained has none