

Econ 172A, Fall 2012: Quiz III Answers

Median: 27/40.

Form 1 (PID ENDS ODD)

1. If overtime costs \$4 per hour, would the company use it?

No. The company doesn't use it now and lowering the cost by \$2 stays within the allowable range.

2. If each unit of Product 1 sold for \$15.50 would the current basis remain optimal?

Yes, because an increase of \$.50 remains in the allowable range.

3. How would the value change if Product 1 sold for \$15.50?

The production plan doesn't change. Profit increases by $\$.5 \times 160 = \80 .

4. What is the most that the company would be willing to pay for the opportunity to use up to 402 units of raw material (instead of 400 units)?

A total of \$9 (\$4.50 more than it normally does). The extra units would increase revenue would by \$6, but \$1.50 of the revenue would be needed to purchase the raw material.

5. How much would the company lose if it had only 300 hours of machine time available?

Insufficient information (change is 20, which is greater than the allowable decrease of 16).

6. If each worker were required (as part of the regular work week) to work 45 hours per week, what would the company's profit be? (That is, assume that the company gets 45 hours per week from a worker without paying overtime.)

This increases labor supply to 180 hours (from 160). This is within the allowable range. Profit goes up by 20 times the shadow price of the labor constraint. So profit goes up by 77.333.

7. How would the firm's profits change if advertising for Product 1 was free?

Increasing the coefficient of advertising in the objective function by one (in order to make advertising free) is within the allowable range. Hence the basis does not change. Profits go up by one dollar times the number of units of A_1 purchased. That is, profits go up by \$11.

8. Suppose that a new product could be sold for \$4.25 per unit using one hour of labor and one hour of machine time (but without any advertising or raw material). Would it be profitable to product the new product?

Yes because \$4.25 is greater than the value of ingredients (one hour of labor at \$3.867 and one free hour of machine time).

Form 2
(PID ENDS EVEN)

1. If overtime costs \$8 per hour, would the company use it?

No. The company doesn't use it now and raising the cost by \$2 stays within the allowable range.

2. If each unit of Product 1 sold for \$16.00 would the current basis remain optimal?

No, because an increase of \$1.00 is outside of the allowable range.

3. How would the value change if Product 1 sold for \$16.00?

Insufficient information.

4. What is the most that the company would be willing to pay for the opportunity to use up to 402 units of raw material (instead of 400 units)?

A total of \$9 (\$4.50 more than it normally does). The extra units would increase revenue would by \$6, but \$1.50 of the revenue would be needed to purchase the raw material.

5. How much would the company lose if it had only 315 hours of machine time available?

Nothing. There is slack in the constraint (and dual variable is zero) and the decrease, 5, is within allowable range.

6. If each worker were required (as part of the regular work week) to work 45 hours per week, what would the company's profit be? (That is, assume that the company gets 45 hours per week from a worker without paying overtime.)

This increases labor supply to 180 hours (from 160). This is within the allowable range. Profit goes up by 20 times the shadow price of the labor constraint. So profit goes up by 77.333.

7. How would the firm's profits change if advertising for Product 2 was free?

Increasing the coefficient of advertising in the objective function by one (in order to make advertising free) is within the allowable range. Hence the basis does not change. Profits go up by one dollar times the number of units of A_2 purchased. That is, profits go up by \$1.333.

8. Suppose that a new product could be sold for \$4 per unit using one hour of labor and one hour of machine time (but without any advertising or raw material). Would it be profitable to product the new product?

Yes because \$4 is greater than the value of ingredients (one hour of labor at \$3.867 and one free hour of machine time).