

Topic: Price of the product

Question: An item is currently selling for \$50/unit. The quantity supplied is decreasing by 10 units/week. At what rate is the price of the item changing?

$$q = 4,000e^{-0.01p}$$

Answer choices:

- A \$2.43 per week
- B \$1.86 per week
- C \$6.59 per week
- D \$0.41 per week



Solution: D

Use implicit differentiation to take the derivative of both sides of the quantity equation.

$$q = 4,000e^{-0.01p}$$

$$\frac{dq}{dt} = -40e^{-0.01p} \frac{dp}{dt}$$

From the question, we know that $p = 50$ and $dq/dt = -10$, so we'll plug those in.

$$-10 = -40e^{-0.01(50)} \frac{dp}{dt}$$

$$-10 = -40e^{-0.50} \frac{dp}{dt}$$

Solve for dp/dt , which is the rate we were asked to find.

$$\frac{dp}{dt} = \frac{-10}{-40e^{-0.50}}$$

$$\frac{dp}{dt} = \frac{1}{4e^{-0.50}}$$

$$\frac{dp}{dt} = \frac{e^{0.50}}{4}$$

$$\frac{dp}{dt} \approx \$0.41$$



Topic: Price of the product

Question: An item is currently selling for \$100/unit. The quantity supplied is decreasing by 20 units/week. At what rate is the price of the item changing?

$$q = 4,000e^{-0.01p}$$

Answer choices:

- A \$0.18 per week
- B \$0.74 per week
- C \$1.36 per week
- D \$5.44 per week



Solution: C

Use implicit differentiation to take the derivative of both sides of the quantity equation.

$$q = 4,000e^{-0.01p}$$

$$\frac{dq}{dt} = -40e^{-0.01p} \frac{dp}{dt}$$

From the question, we know that $p = 100$ and $dq/dt = -20$, so we'll plug those in.

$$-20 = -40e^{-0.01(100)} \frac{dp}{dt}$$

$$-20 = -40e^{-1} \frac{dp}{dt}$$

Solve for dp/dt , which is the rate we were asked to find.

$$\frac{dp}{dt} = \frac{-20}{-40e^{-1}}$$

$$\frac{dp}{dt} = \frac{1}{2e^{-1}}$$

$$\frac{dp}{dt} = \frac{e}{2}$$

$$\frac{dp}{dt} \approx \$1.36$$



Topic: Price of the product

Question: An item is currently selling for \$150/unit. The quantity supplied is decreasing by 25 units/week. At what rate is the price of the item changing?

$$q = 4,000e^{-0.01p}$$

Answer choices:

- A \$1.03 per week
- B \$2.80 per week
- C \$2.64 per week
- D \$0.97 per week



Solution: B

Use implicit differentiation to take the derivative of both sides of the quantity equation.

$$q = 4,000e^{-0.01p}$$

$$\frac{dq}{dt} = -40e^{-0.01p} \frac{dp}{dt}$$

From the question, we know that $p = 150$ and $dq/dt = -25$, so we'll plug those in.

$$-25 = -40e^{-0.01(150)} \frac{dp}{dt}$$

$$-25 = -40e^{-1.50} \frac{dp}{dt}$$

Solve for dp/dt , which is the rate we were asked to find.

$$\frac{dp}{dt} = \frac{-25}{-40e^{-1.50}}$$

$$\frac{dp}{dt} = \frac{5}{8e^{-1.50}}$$

$$\frac{dp}{dt} = \frac{5e^{1.50}}{8}$$

$$\frac{dp}{dt} \approx \$2.80$$

