

Show all work clearly and in order, and circle your final answers. Justify your answers algebraically whenever possible. Please write down all relevant mathematics. You have 20 minutes.

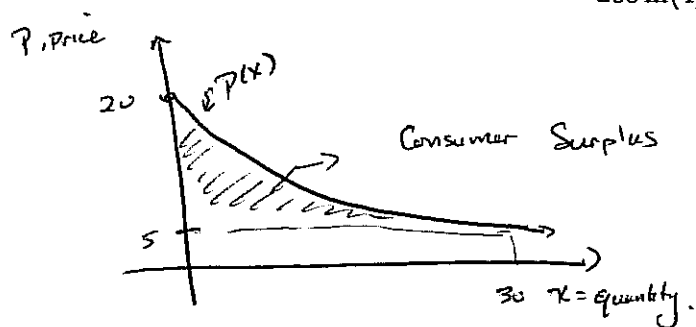
1. Suppose that the demand curve for asparagus flavored lollipops is given by

$$p(x) = \frac{200}{x+10}.$$

What is the demand if the price for these delicious lollipops is 5? Draw a graph (with axes labeled) of the area that represents the consumer surplus if the price is 5. Compute the consumer surplus.

Solving  $p(x) = \frac{200}{x+10} = 5$  we get that the quantity demanded is  $x = 30$ . Consumer surplus is:

$$\begin{aligned} \int_0^{30} \frac{200}{x+10} - 5 dx &= 200 \ln(|x+10|) - 5x \Big|_0^{30} \\ &= 200 \ln(40) - 150 - (200 \ln(10)) \\ &= 200 \ln(4) - 150. \end{aligned}$$



2. Find the volume of the solid of revolution given by rotating the function  $f(x) = (2x+1)^{10}$  around the x-axis on the interval  $[0, 1]$ .

$$\pi \int_0^1 (2x+1)^{20} dx = \frac{\pi}{42} [(2x+1)^{21}]_0^1 = \frac{\pi}{42} (3^{21} - 1)$$

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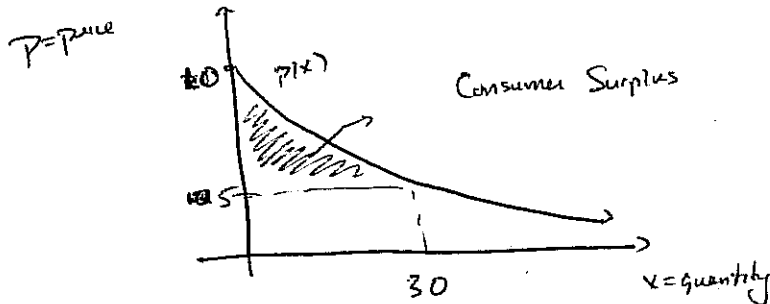
1. Suppose that the demand curve for asparagus flavored lollipops is given by

$$p(x) = \frac{300}{x + 30}.$$

What is the demand if the price for these delicious lollipops is 5? Draw a graph (with axes labeled) of the area that represents the consumer surplus if the price is 5. Compute the consumer surplus.

Solving  $p(x) = \frac{300}{x+30} = 5$  we get that the quantity demanded is  $x = 30$ . The consumer surplus is

$$\begin{aligned} \int_0^{30} \frac{300}{x+30} - 5 dx &= 300 \ln(|x+30|) - 5x \Big|_0^{30} \\ &= 300 \ln(60) - 150 - (300 \ln(30)) \\ &= 300 \ln(2) - 150 \end{aligned}$$



2. Find the volume of the solid of revolution given by rotating the function  $f(x) = e^{2x+3}$  around the x-axis on the interval  $[0, 1]$ .

Volume is:

$$\pi \int_0^1 e^{4x+6} dx = \frac{e^6 \pi}{4} e^{4x} \Big|_0^1 = \frac{e^6 \pi}{4} [e^4 - 1]$$

Show all work clearly and in order, and circle your final answers. Justify your answers algebraically whenever possible. Please write down all relevant mathematics. You have 20 minutes.

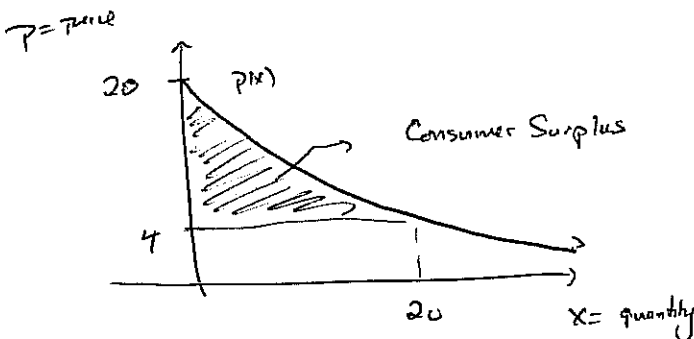
1. Suppose that the demand curve for asparagus flavored lollipops is given by

$$p(x) = \frac{100}{x+5}.$$

What is the demand if the price for these delicious lollipops is 4? Draw a graph (with axes labeled) of the area that represents the consumer surplus if the price is 4. Compute the consumer surplus.

Solving  $p(x) = \frac{100}{x+5} = 4$  we get that the quantity demanded is  $x = 20$ . The consumer surplus is

$$\begin{aligned} \int_0^{20} \frac{100}{x+5} - 4 dx &= 100 \ln(|x+5|) - 4x \Big|_0^{20} \\ &= 100 \ln(25) - 80 - (100 \ln(5)) \\ &= 100 \ln(5) - 80 \end{aligned}$$



2. Find the volume of the solid of revolution given by rotating the function  $f(x) = \frac{3}{(x+1)^2}$  around the x-axis on the interval  $[0, 1]$ .

The volume is:

$$9\pi \int_0^1 \frac{1}{(x+1)^4} dx = -\frac{9\pi}{3} \left[ \frac{1}{(x+1)^3} \right]_0^1 = \frac{9\pi}{3} \left[ 1 - \frac{1}{8} \right]$$