Sheet width = 120 Sheet length = 500

Sheet Area = 60000 Sheet Perimeter = 1240

length of box = $500-2\cdot x$

width of box = $120-2\cdot x$

height of box = x

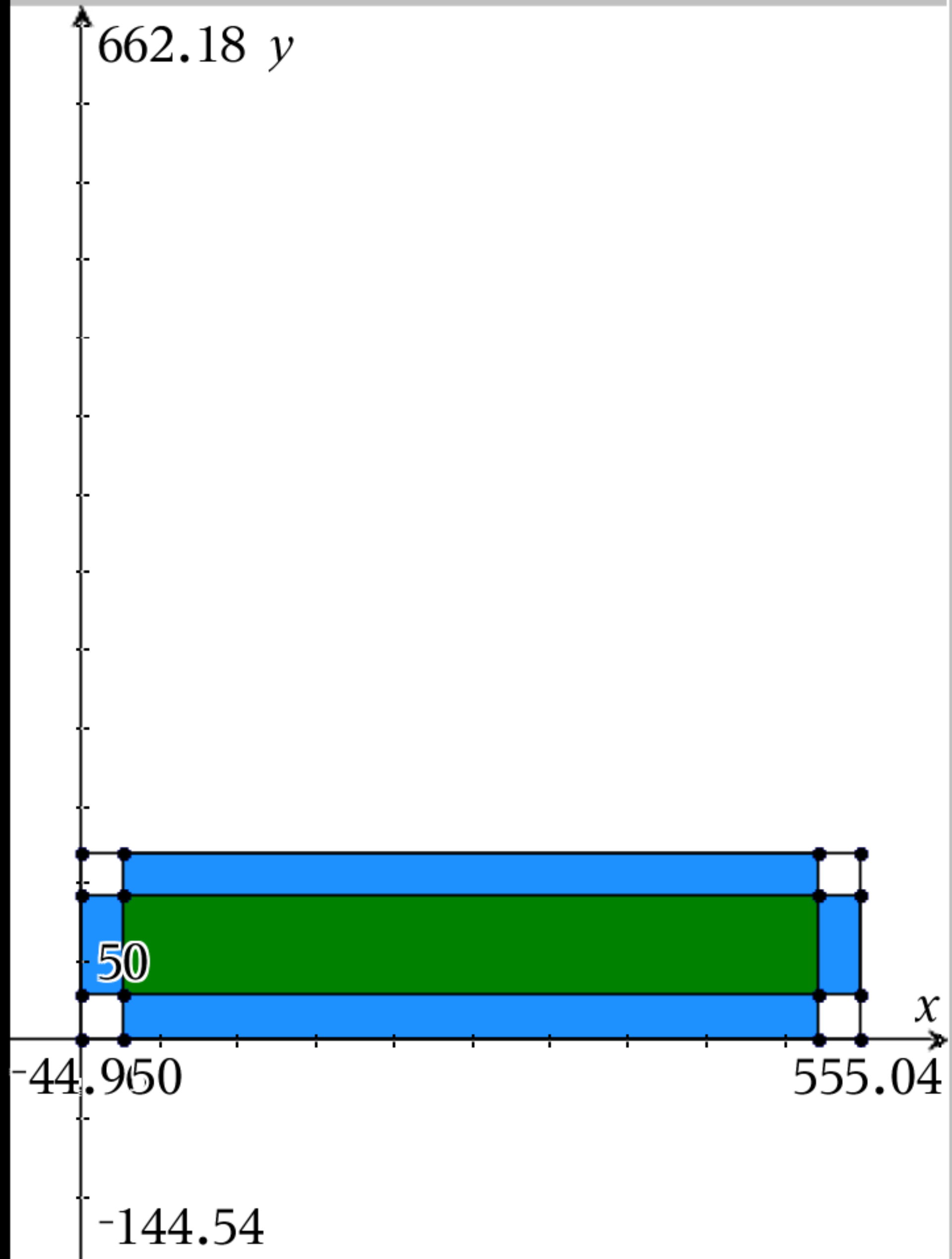
Surface Area of open top box

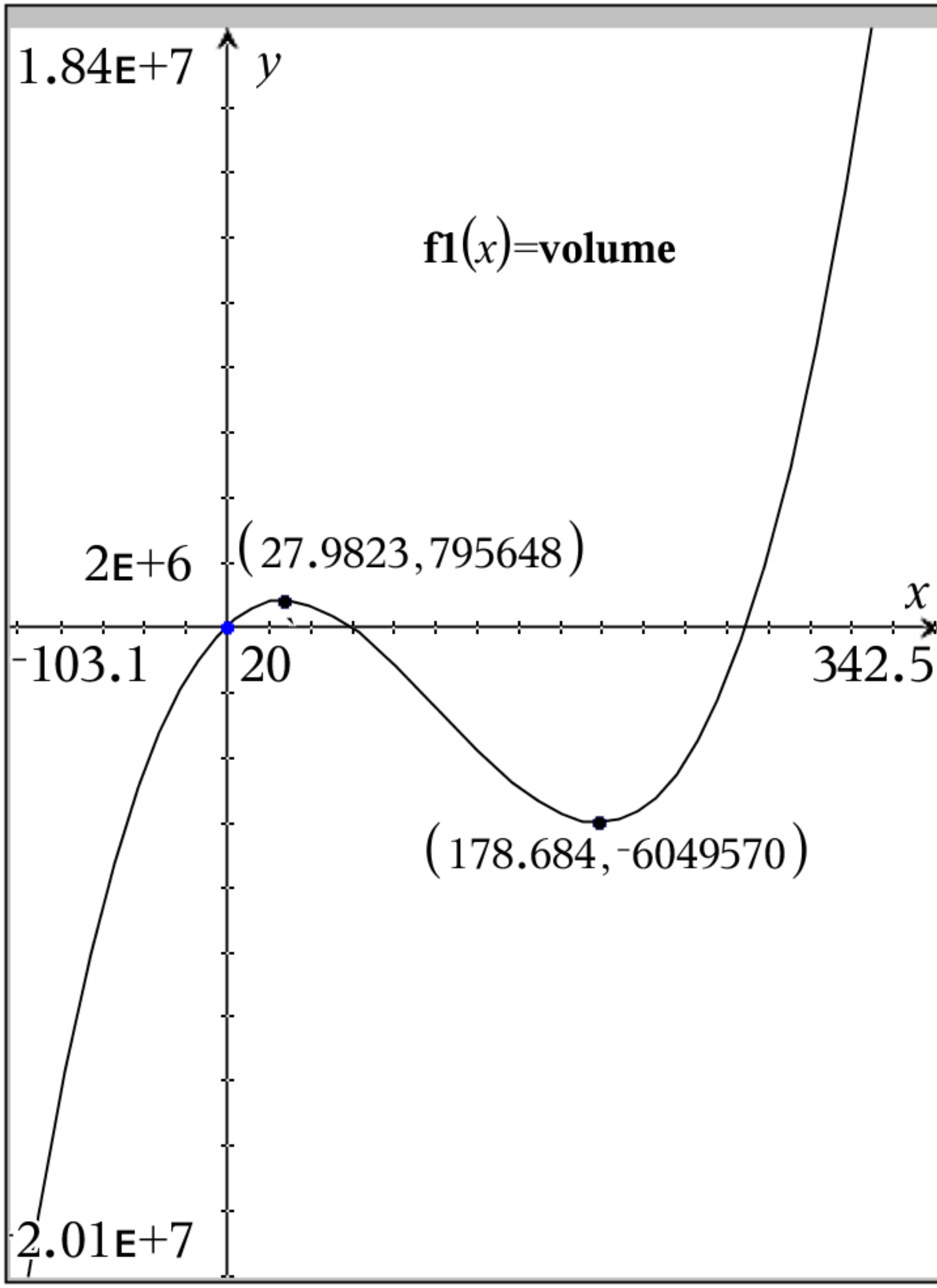
SA(x) = $60000-4\cdot x^2$ $\frac{dSA}{dx} = {}^-8\cdot x$

Volume of open top box

$$V(x) = (500-2\cdot x)(120-2\cdot x)x$$
$$= 4\cdot x\cdot (x-250)\cdot (x-60)$$
$$= 4\cdot x^3-1240\cdot x^2+60000\cdot x$$

$$\frac{dV}{dx} = 12\cdot x^2-2480\cdot x+60000$$





$V(x) = 4\cdot x\cdot (x-250)\cdot (x-60)$

$= 4\cdot x^3 - 1240\cdot x^2 + 60000\cdot x$

$\frac{dV}{dx} = 12\cdot x^2 - 2480\cdot x + 60000$

$0 = 12\cdot x^2 - 2480\cdot x + 60000$

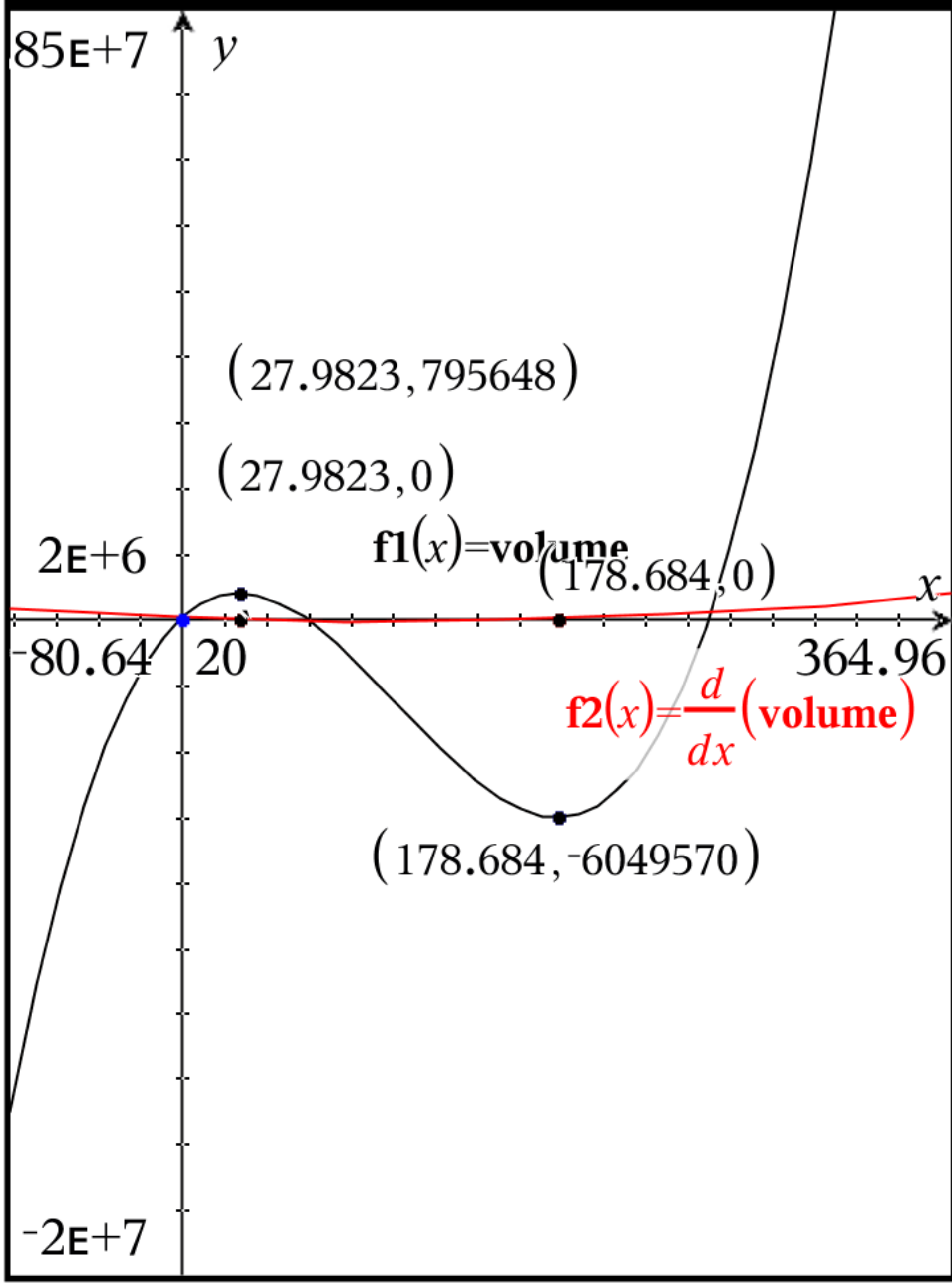
$D = (^{-}2480)^2 - 4(12)(60000) = 3270400$

$x = \frac{2480-\sqrt{3270400}}{2\cdot 12} \approx 27.98$

$x = \frac{2480+\sqrt{3270400}}{2\cdot 12} \approx 178.7$

$V(27.98) \approx 795648.2832$

$V(178.7) \approx {}^{-}6049574.209$



$V(x) = 4 \cdot x \cdot (x-250) \cdot (x-60)$

$= 4 \cdot x^3 - 1240 \cdot x^2 + 60000 \cdot x$

$\frac{dV}{dx} = 12 \cdot x^2 - 2480 \cdot x + 60000$

$0 = 12 \cdot x^2 - 2480 \cdot x + 60000$

$D = (-2480)^2 - 4(12)(60000) = 3270400$

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$V(27.98) \approx 795648.2832$

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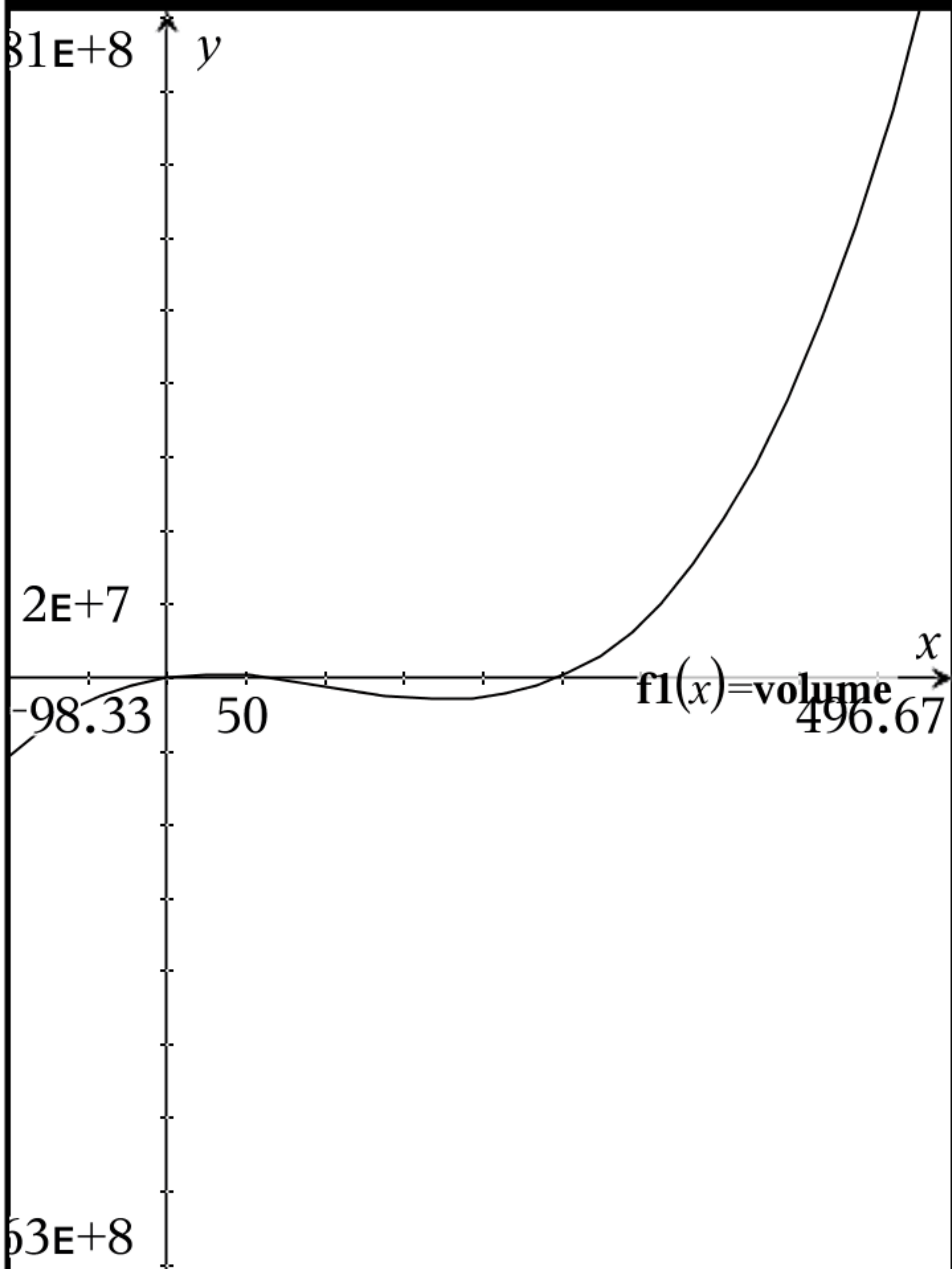


Where is V(x) > 0?

V(x) > 0 when x ∈(0,60) or x > 250

Where is V(x) < 0?

V(x) < 0 when x < 0

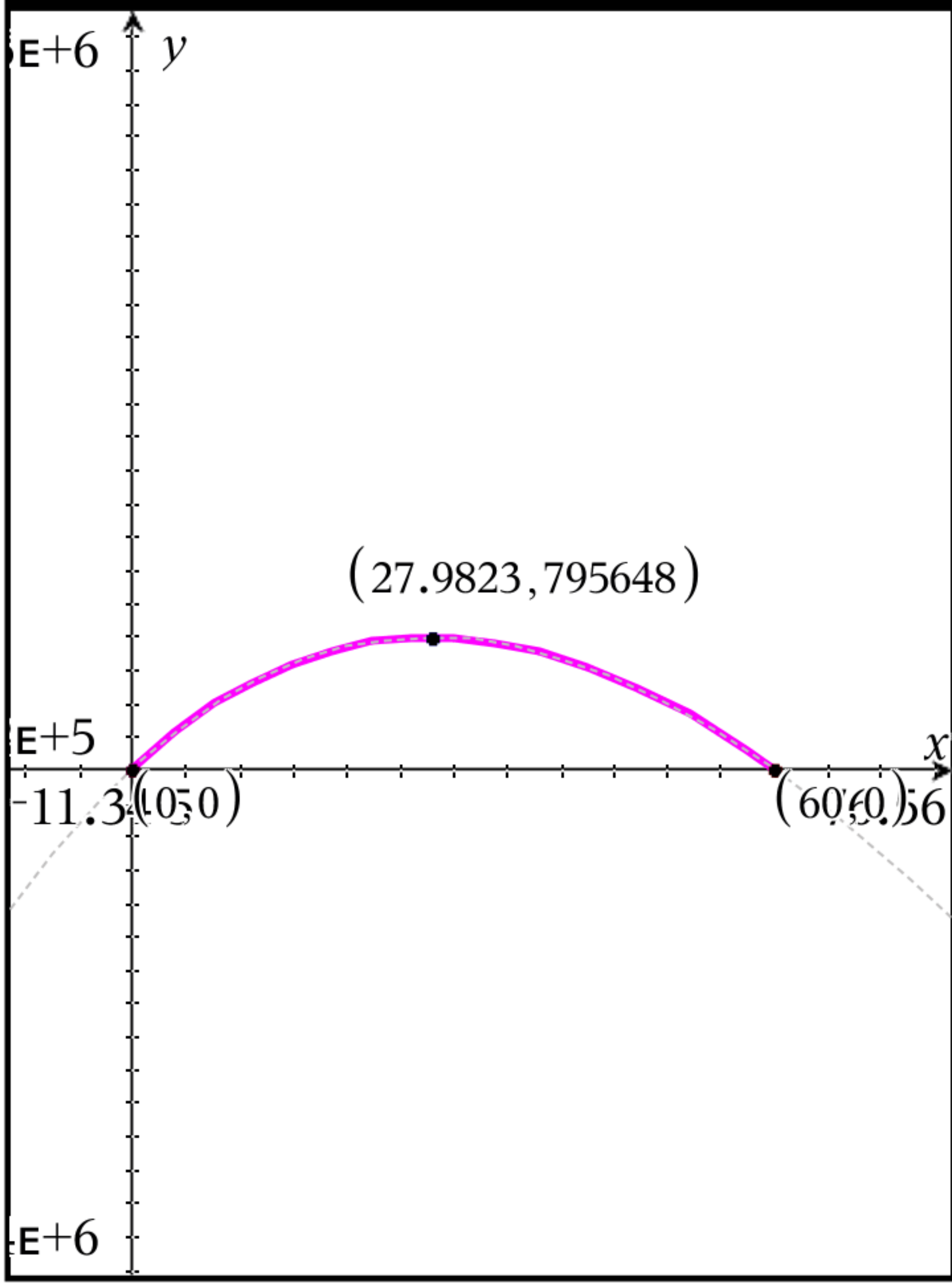
OR x ∈(60 , 250)

Where is V(x) = 0?

V(x) = 0 x = 0 OR x =60 OR x =250

What is the FEASIBLE DOMAIN?

x ∈(0,60)



Given Sheet Dimensions

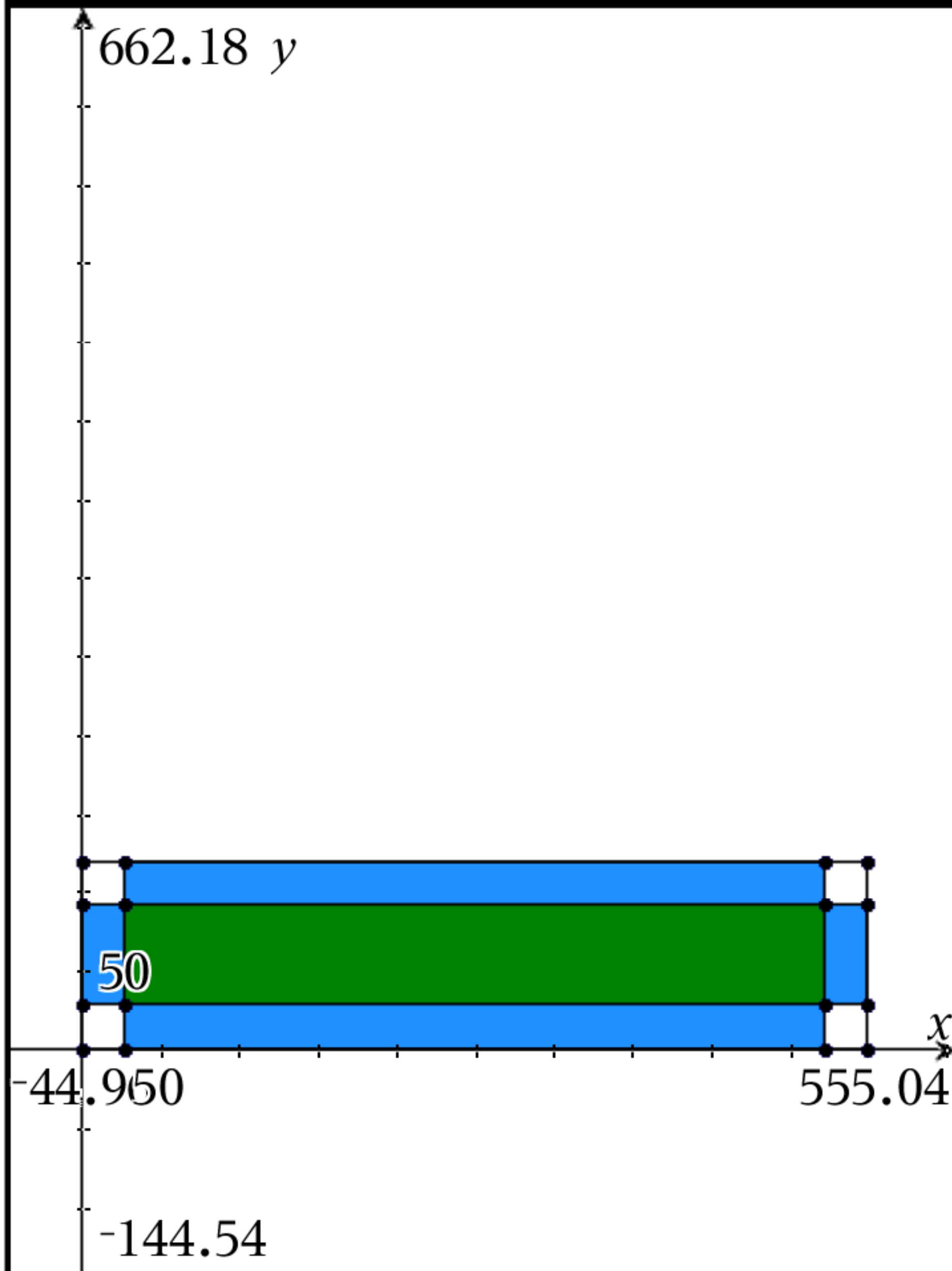
500 **by** 120

What is the FEASIBLE DOMAIN for x?

$x \in (0,60)$

Why?

The square corner cut needs to be less than $\frac{1}{2}$ of the smallest side of the sheet of the material given



What are the dimensions that will yield the maximum volume when you are making an open top rectangular box out of a sheet of material with dimensions 500 by 120 ?

Exact Dimensions

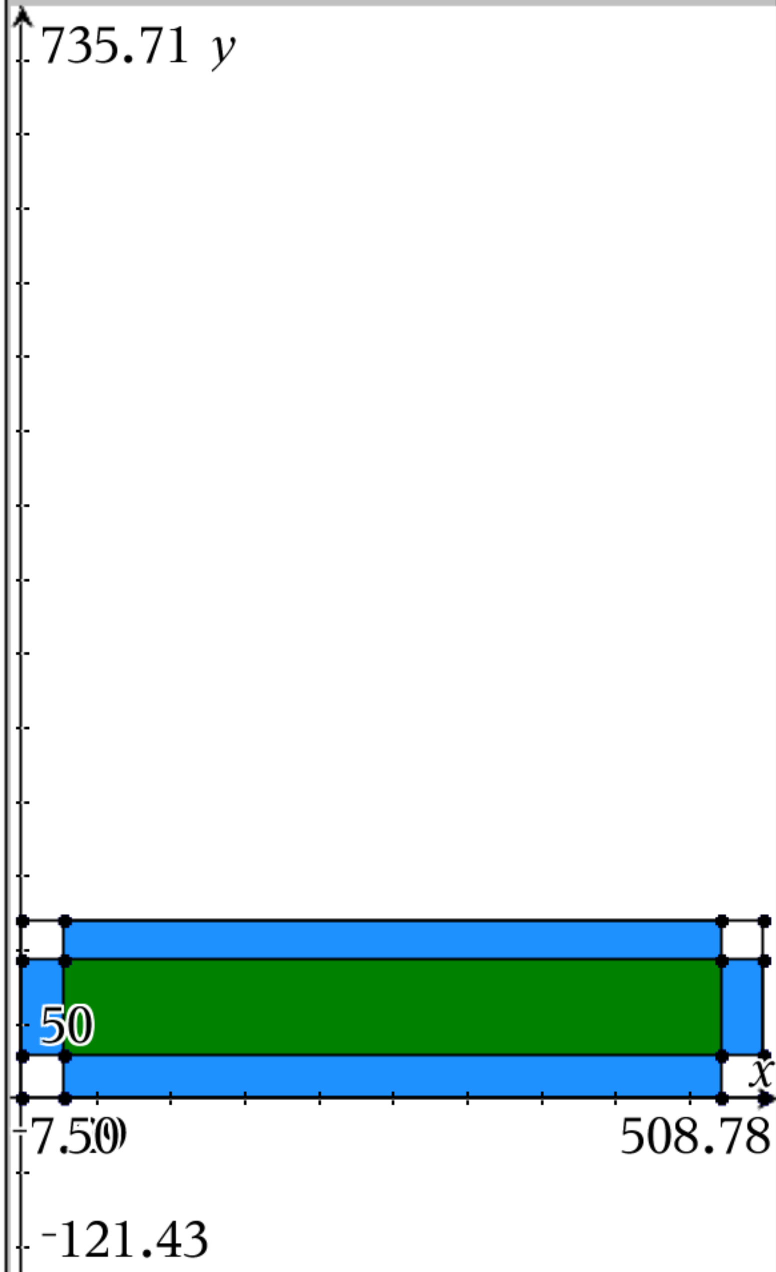
$\frac{20\cdot\sqrt{511}}{3}+\frac{880}{3}$ **by** $\frac{20\cdot\sqrt{511}}{3}-\frac{260}{3}$ **by** $\frac{-10\cdot\left(\sqrt{511}-31\right)}{3}$

Approximate Dimensions

444.04 by 64.035 by 27.98

$\frac{dV}{dx}$ **at = 1.5**

V'(1.5)=56307.



What is the maximum volume when you are making an open top rectangular box out of a sheet of material with dimensions 500 by 120 ?

Exact Dimensions

$\frac{20\cdot\sqrt{511}}{3}+\frac{880}{3}$ **by** $\frac{20\cdot\sqrt{511}}{3}-\frac{260}{3}$ **by** $\frac{^{-}10\cdot\left(\sqrt{511}-31\right)}{3}$

Approximate Dimensions

444.04 by 64.035 by 27.98

EXACT Volume

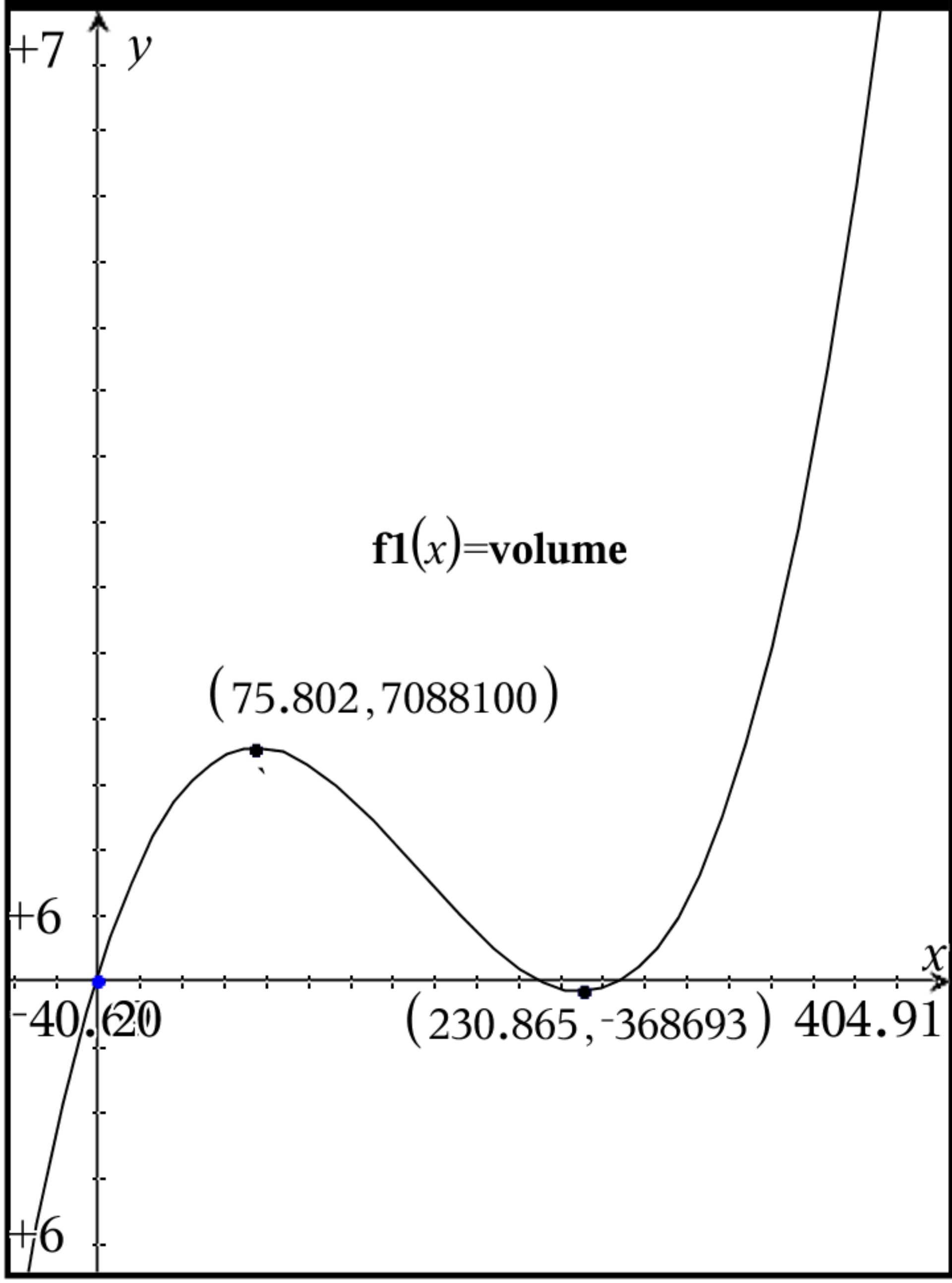
$$\mathbf{V}\left(\frac{^{-}10\cdot\left(\sqrt{511}-31\right)}{3}\right)=\frac{4088000\cdot\sqrt{511}}{27}-\frac{70928000}{27}$$

Approximate Volume

$\mathbf{V}(27.98)=795648.2832$

	A	B	C x_1	D y_1	E x_
=					
1	sheet length	500	0	0	
2	sheet width	120	0	49.9	x_te
3	_1	500−2*x	0	w_sheet−x_given	x_te
4	w_1	120−2*x	0	w_sheet	
5	h_1	x	x_given	0	
6	volume	4*x*(x−250)*(x−6..	49.9	49.9	
7	sa_1	60000−4*x^2	x_given	w_sheet−x_given	
8	sheet perimet...	1240	x_given	w_sheet	
9	sheet area	60000	l_sheet−x_given	0	
10	a_1	4	l_sheet−x_given	49.9	
11	p_1	1240	l_sheet−x_given	w_sheet−x_given	

A1 "sheet length "



V(x) $=4\cdot x\cdot (x-250)\cdot (x-210)$

$=4\cdot x^3-1840\cdot x^2+210000\cdot x$

$$\frac{dV}{dx}=12\cdot x^2-3680\cdot x+210000$$

$0=12\cdot x^2-3680\cdot x+210000$

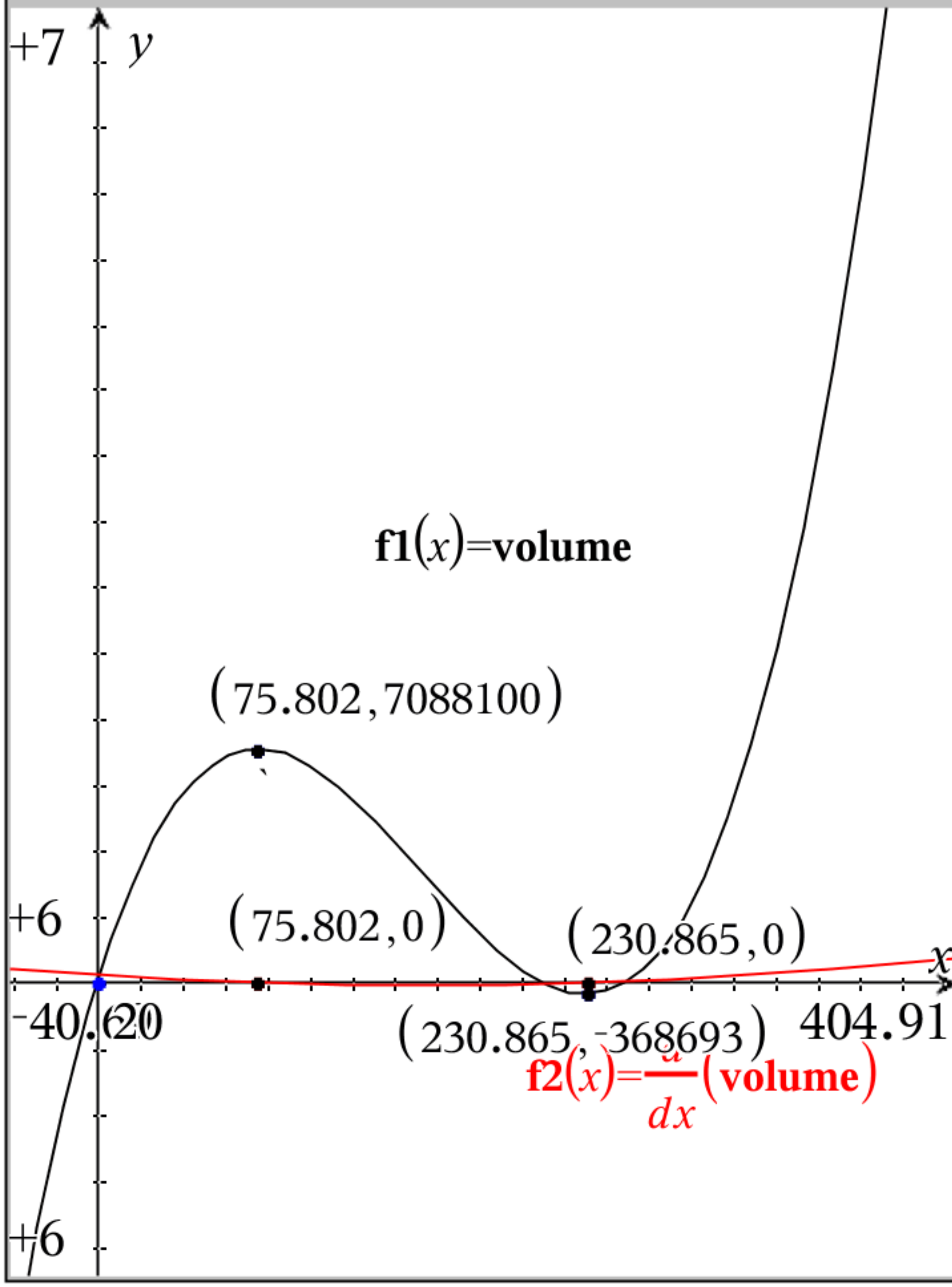
$D=(^-3680)^2-4(12)(210000)=3462400$

$$x=\frac{3680-\sqrt{3462400}}{2\cdot 12}\approx 75.8$$

$$x=\frac{2480+\sqrt{3462400}}{2\cdot 12}\approx 230.9$$

$V(75.8)\approx 7088100.452$

$V(230.9)\approx {}^-368693.0442$



$V(x) = 4\cdot x\cdot (x-250)\cdot (x-210)$

$= 4\cdot x^{3} - 1840\cdot x^{2} + 210000\cdot x$

$\frac{dV}{dx} = 12\cdot x^{2} - 3680\cdot x + 210000$

$0 = 12\cdot x^{2} - 3680\cdot x + 210000$

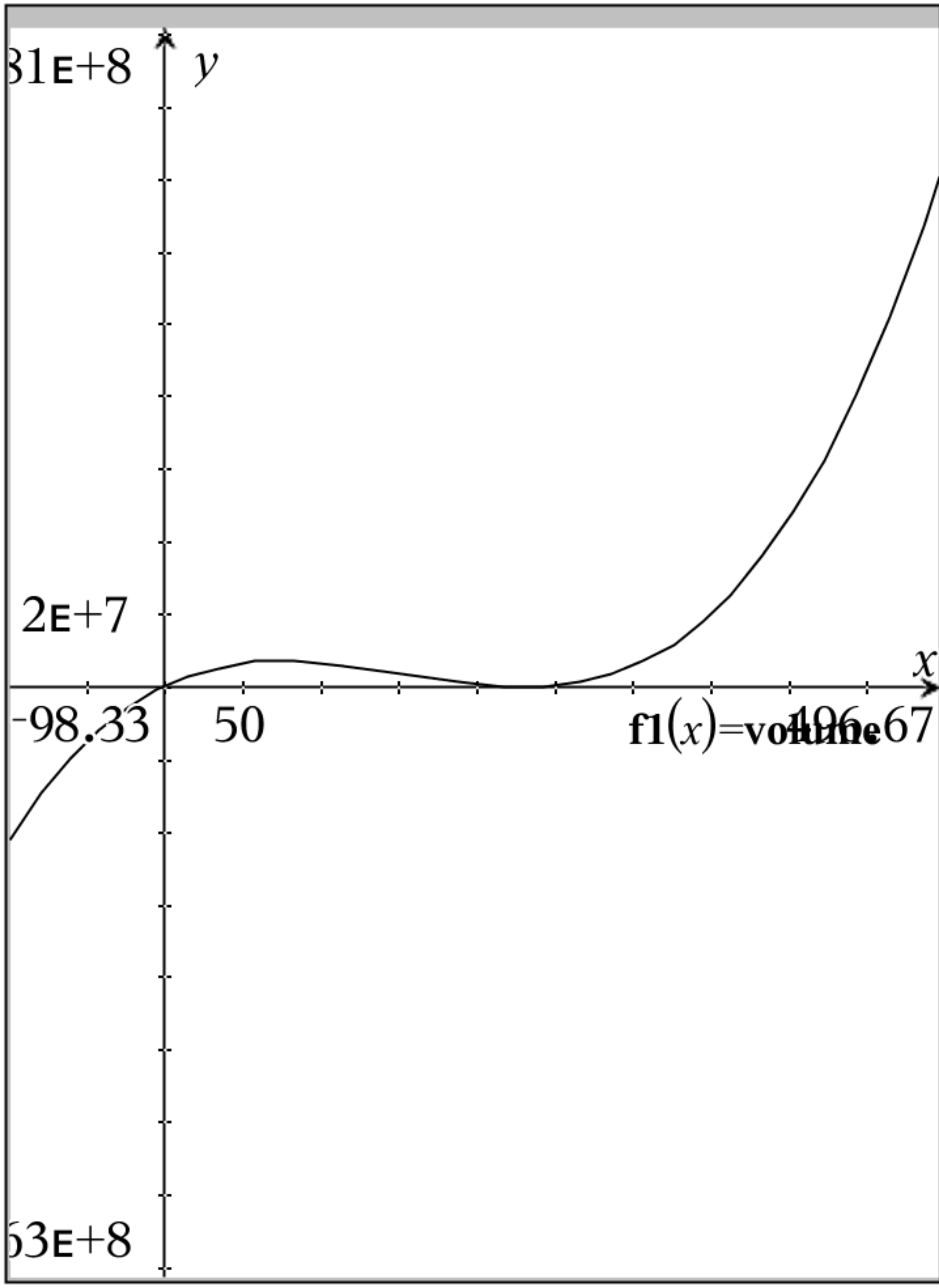
$D = (-3680)^{2} - 4(12)(210000) = 3462400$

$x = \frac{112-\sqrt{3904}}{2\cdot 12} = \frac{-(\sqrt{61}-14)}{3} \approx 75.8$

$x = \frac{112+\sqrt{3904}}{2\cdot 12} = \frac{\sqrt{61}+14}{3} \approx 230.9$

$V(75.8) \approx 7088100.452$

$V(230.9) \approx -368693.0442$



Where is V(x) > 0?

V(x) > 0 when x ∈(0,210) or x > 250

Where is V(x) < 0?

V(x) < 0 when x < 0

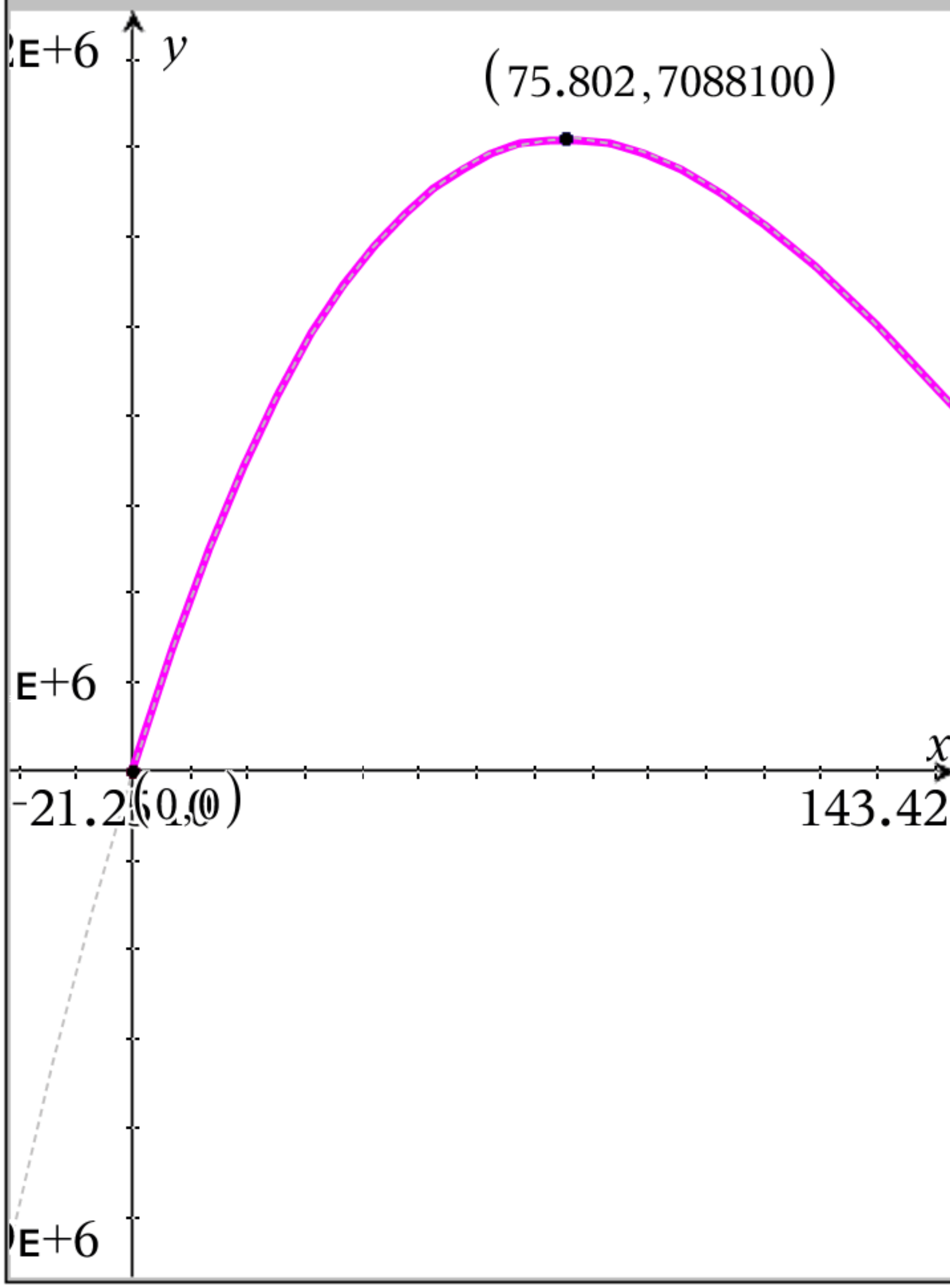
OR x ∈(210 , 250)

Where is V(x) = 0?

V(x) = 0   x = 0 OR x =210 OR x =250

What is the FEASIBLE DOMAIN?

x ∈(0,210)



Given Sheet Dimensions

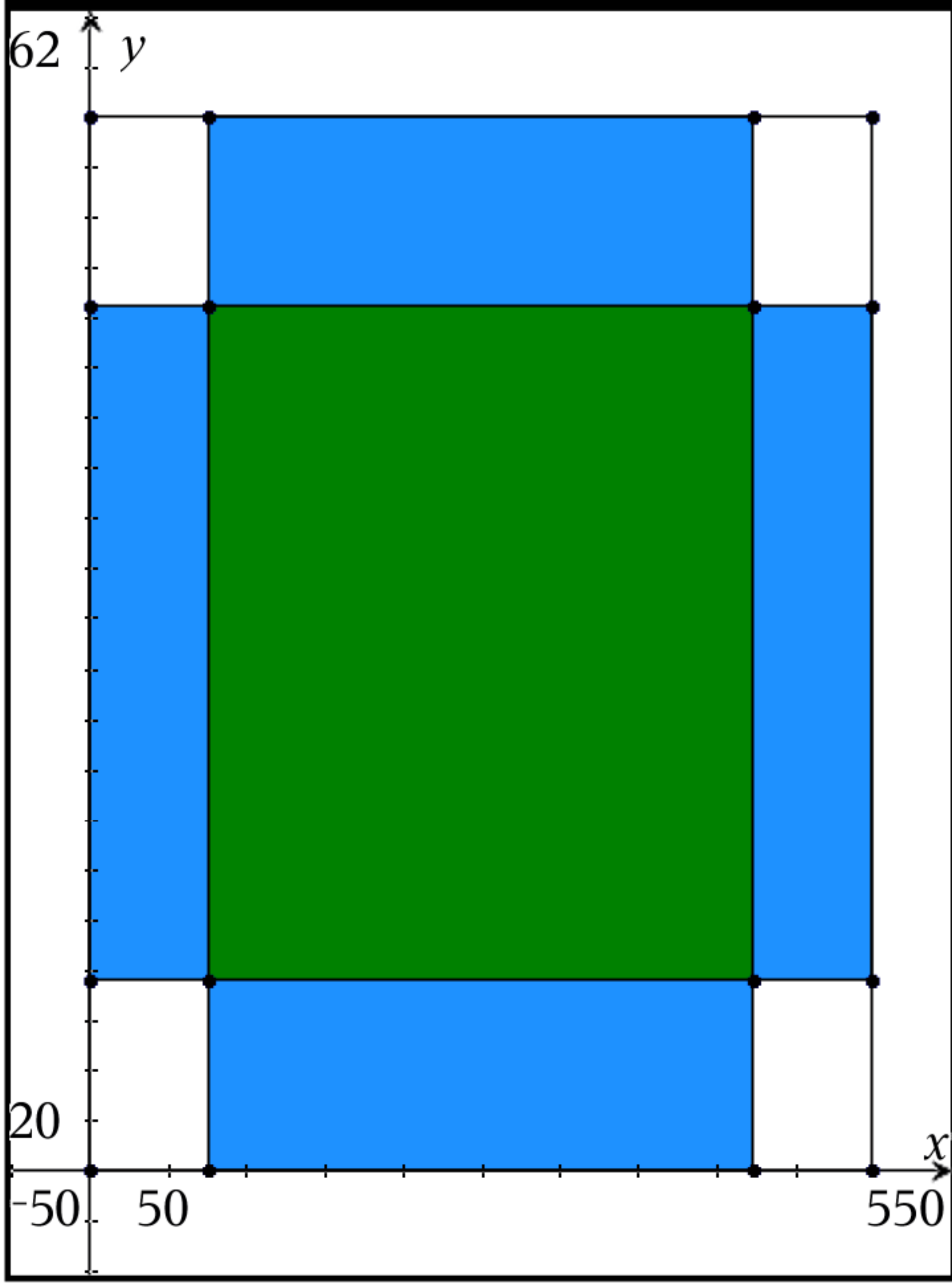
500 **by** 420

What is the FEASIBLE DOMAIN for x?

$x \in (0,210)$

Why?

The square corner cut needs to be less than $\frac{1}{2}$ of the smallest side of the sheet of the material given



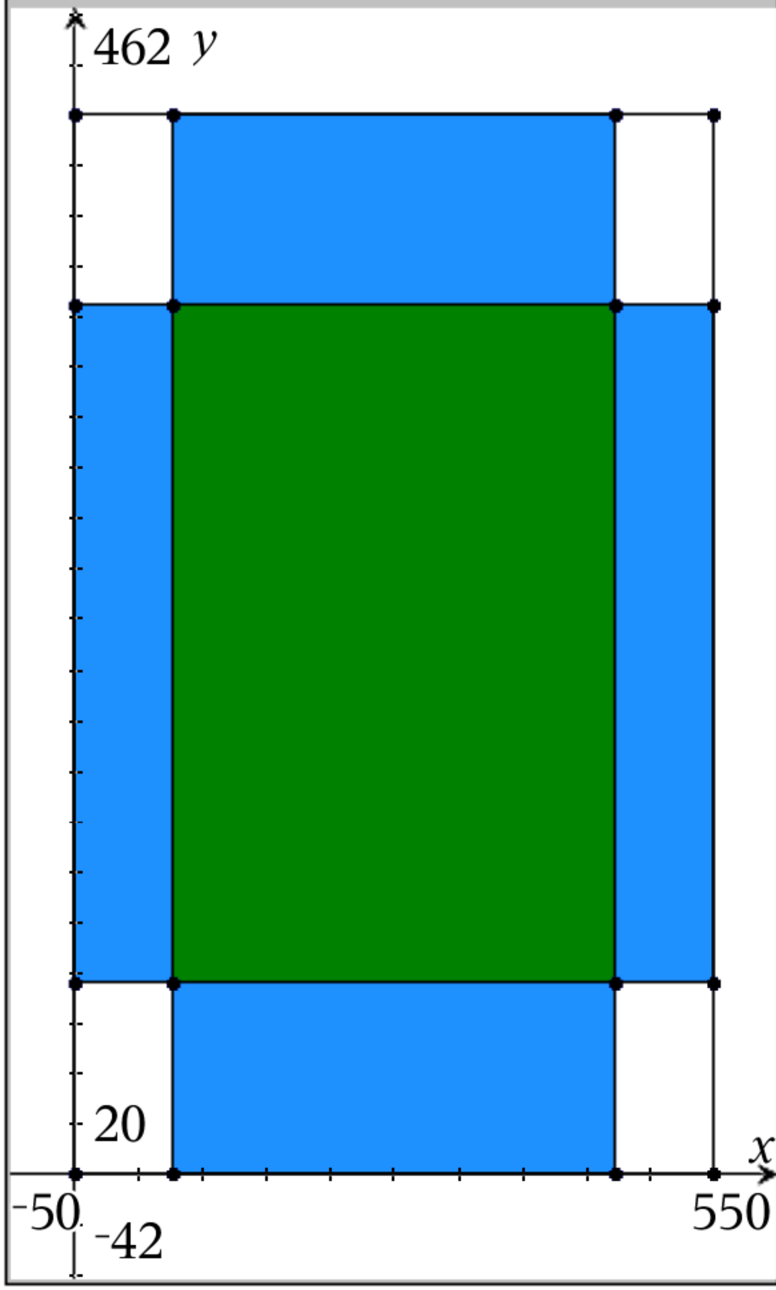
What are the dimensions that will yield the maximum volume when you are making an open top rectangular box out of a sheet of material with dimensions 500 by 420 ?

Exact Dimensions

$\frac{20\cdot\sqrt{541}}{3}+\frac{580}{3}$ **by** $\frac{20\cdot\sqrt{541}}{3}+\frac{340}{3}$ **by** $\frac{^{-}10\cdot\left(\sqrt{541}-46\right)}{3}$

Approximate Dimensions

348.4 by 268.4 by 75.8



What is the maximum volume when you are making an open top rectangular box out of a sheet of material with dimensions 500 by 420 ?

Exact Dimensions

$\frac{20\cdot\sqrt{541}}{3}+\frac{580}{3}$ **by** $\frac{20\cdot\sqrt{541}}{3}+\frac{340}{3}$ **by** $\frac{-10\cdot(\sqrt{541}-46)}{3}$

Approximate Dimensions

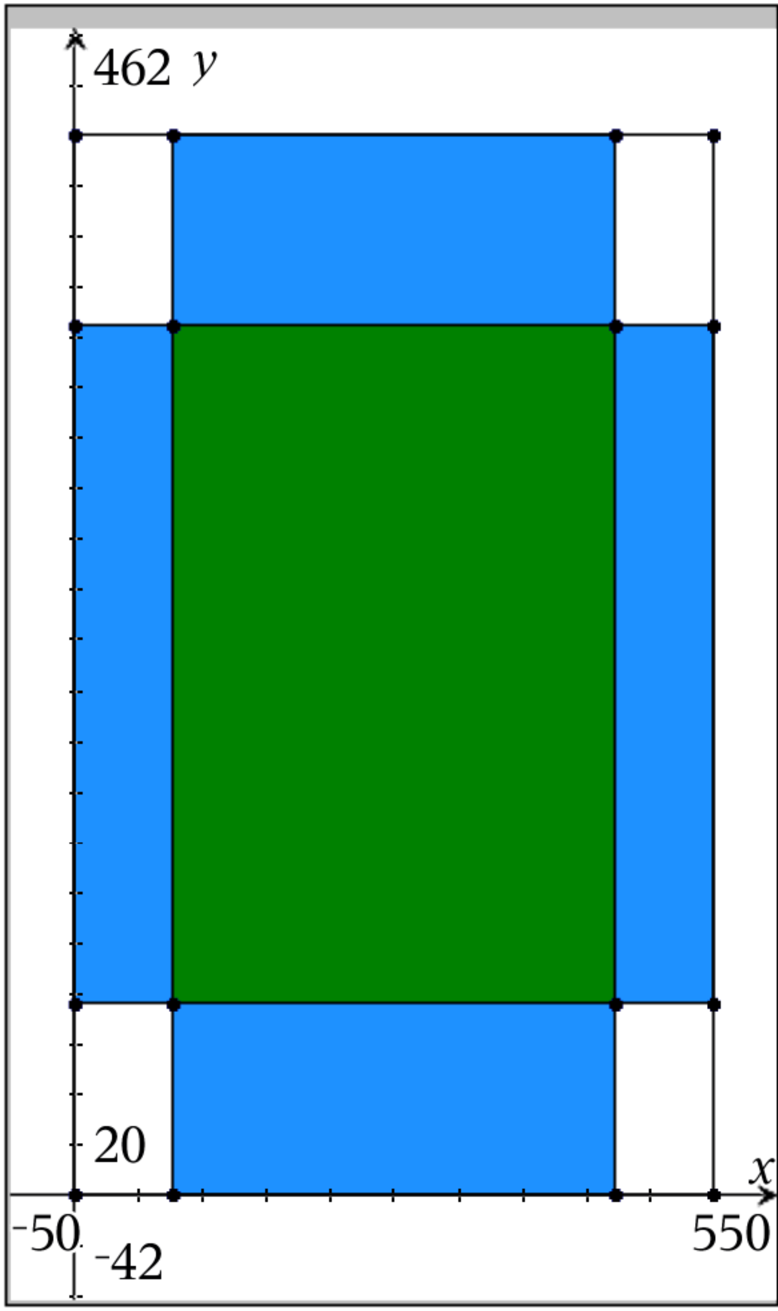
348.4 by 268.4 by 75.8

EXACT Volume

$V\left(\frac{-10\cdot(\sqrt{541}-46)}{3}\right)=\frac{4328000\cdot\sqrt{541}}{27}+\frac{90712000}{27}$

Approximate Volume

$V(75.8)=7088100.452$



What is the maximum volume when you are making an open top rectangular box out of a sheet of material with dimensions 500 by 420 ?

Approximate Dimensions

348.4 by 268.4 by 75.8

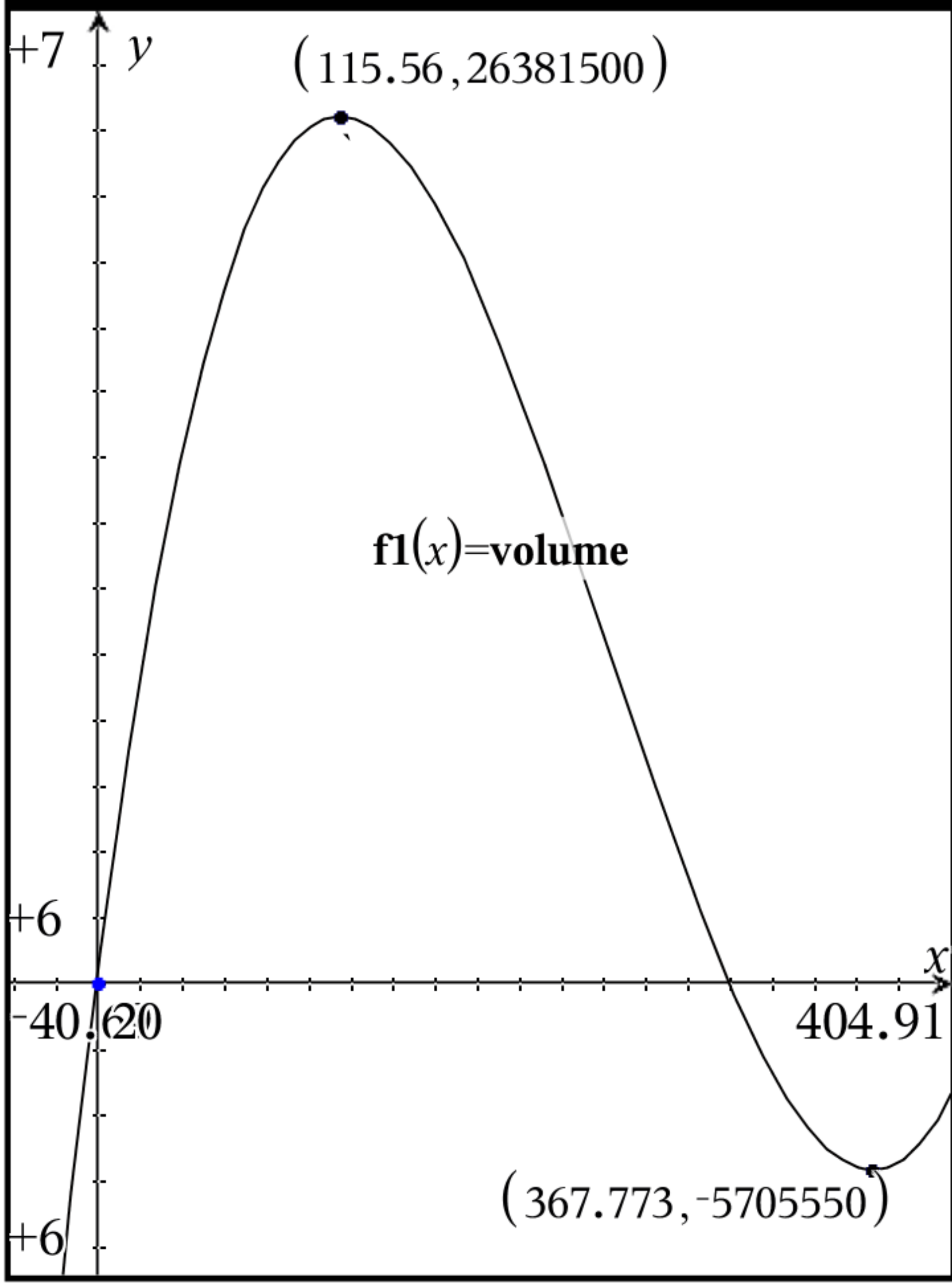
Approximate Volume

V(75.8 **)=**7088100.452

$\frac{dV}{dx}$ **at = 2.5 V'**(2.5 **)=f7**(2.5) = 200875.

	A	B	C x_1	D y_1	E x_
=					
1	sheet length	500	0	0	
2	sheet width	420	0	49.9	x_te
3	_1	500−2*x	0	w_sheet−x_given	x_te
4	w_1	420−2*x	0	w_sheet	
5	h_1	x	x_given	0	
6	volume	4*x*(x−250)*(x−2..	49.9	49.9	
7	sa_1	210000−4*x^2	x_given	w_sheet−x_given	
8	sheet perimet...	1840	x_given	w_sheet	
9	sheet area	210000	l_sheet−x_given	0	
10	a_1	4	l_sheet−x_given	49.9	
11	p_1	1840	l_sheet−x_given	w_sheet−x_given	

A1 "sheet length "



$V(x) = 4 \cdot x \cdot (x-425) \cdot (x-300)$

$= 4 \cdot x^3 - 2900 \cdot x^2 + 510000 \cdot x$

$\frac{dV}{dx} = 12 \cdot x^2 - 5800 \cdot x + 510000$

$0 = 12 \cdot x^2 - 5800 \cdot x + 510000$

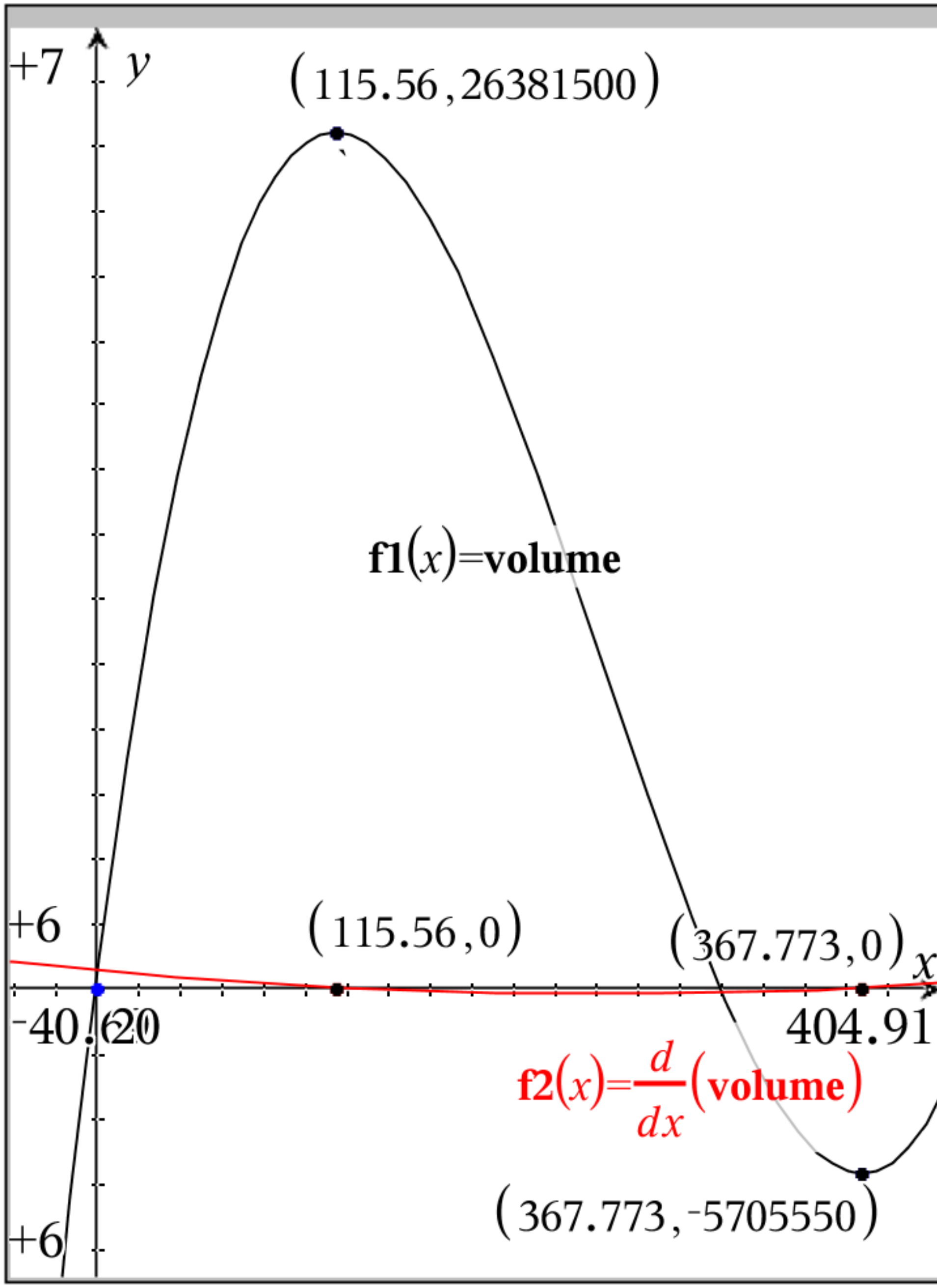
$D = (-5800)^2 - 4(12)(510000) = 9160000$

$x = \frac{5800 - \sqrt{9160000}}{2 \cdot 12} \approx 115.6$

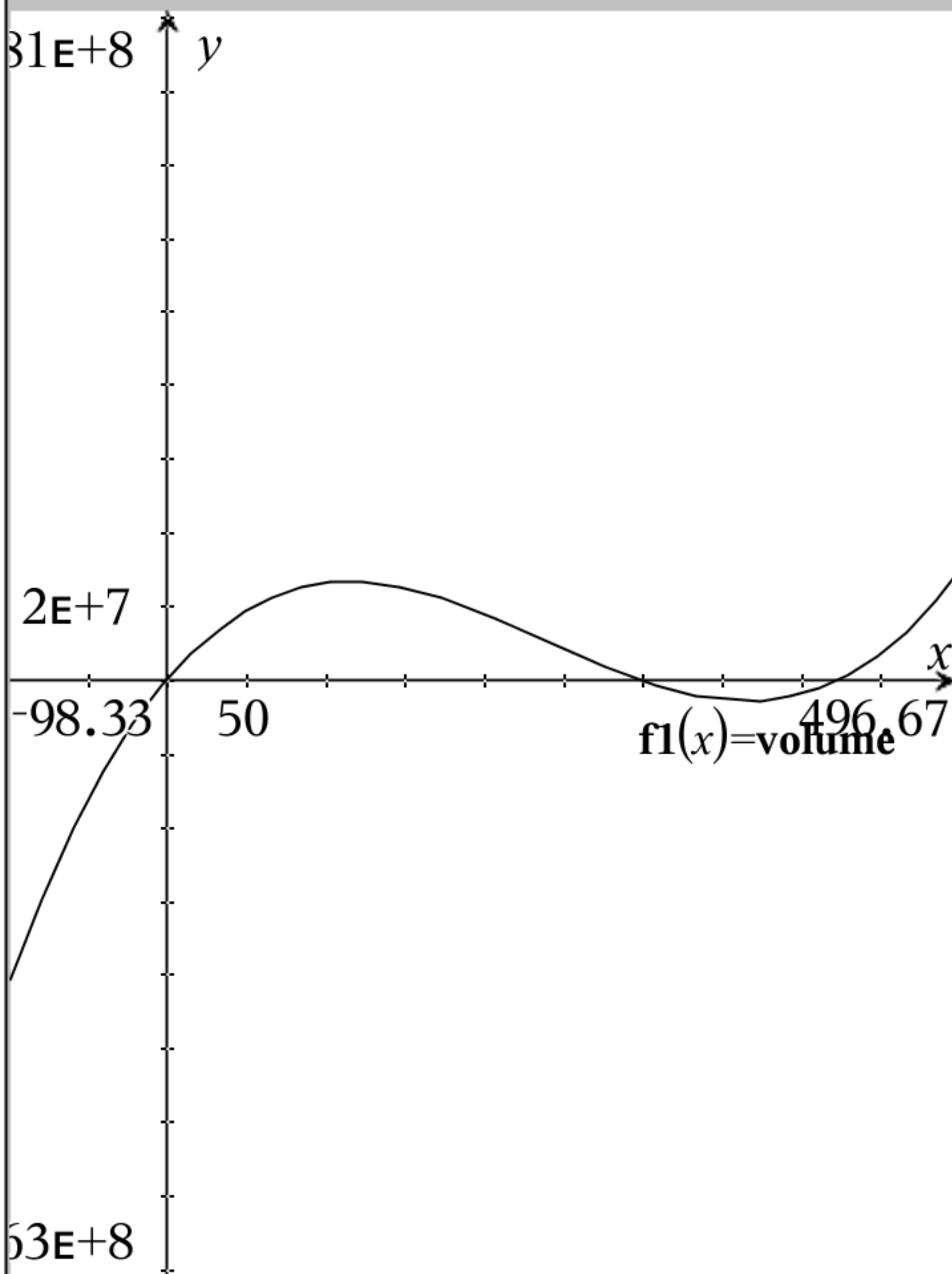
$x = \frac{5800 + \sqrt{9160000}}{2 \cdot 12} \approx 367.8$

$V(115.6) \approx 26381476.03$

$V(367.8) \approx -5705550.105$



$$V(x) = 4\cdot x\cdot(x-425)\cdot(x-300)$$
$$= 4\cdot x^3 - 2900\cdot x^2 + 510000\cdot x$$
$$\frac{dV}{dx} = 12\cdot x^2 - 5800\cdot x + 510000$$
$$0 = 12\cdot x^2 - 5800\cdot x + 510000$$
$$D = (-5800)^2 - 4(12)(510000) = 9160000$$
$$x = \frac{112-\sqrt{3904}}{2\cdot 12} = \frac{-(\sqrt{61}-14)}{3} \approx 115.6$$
$$x = \frac{112+\sqrt{3904}}{2\cdot 12} = \frac{\sqrt{61}+14}{3} \approx 367.8$$
$$V(115.6) \approx 26381476.03$$
$$V(367.8) \approx -5705550.105$$



Where is V(x) > 0?

V(x) > 0 when x ∈(0,300) or x > 425

Where is V(x) < 0?

V(x) < 0 when x < 0

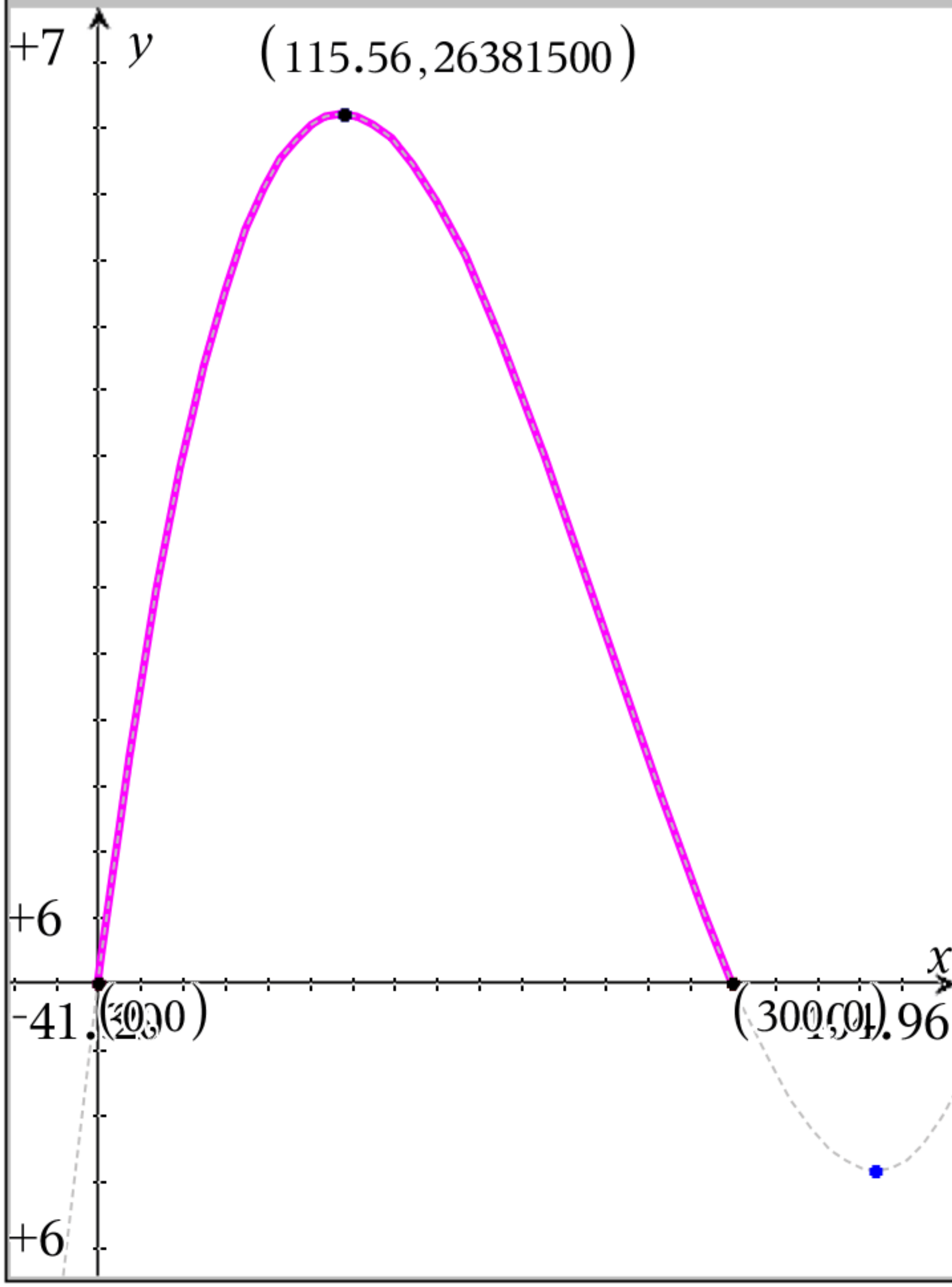
OR x ∈(300 , 425)

Where is V(x) = 0?

V(x) = 0   x = 0 OR x =300 OR x =425

What is the FEASIBLE DOMAIN?

x ∈(0,300)



Given Sheet Dimensions

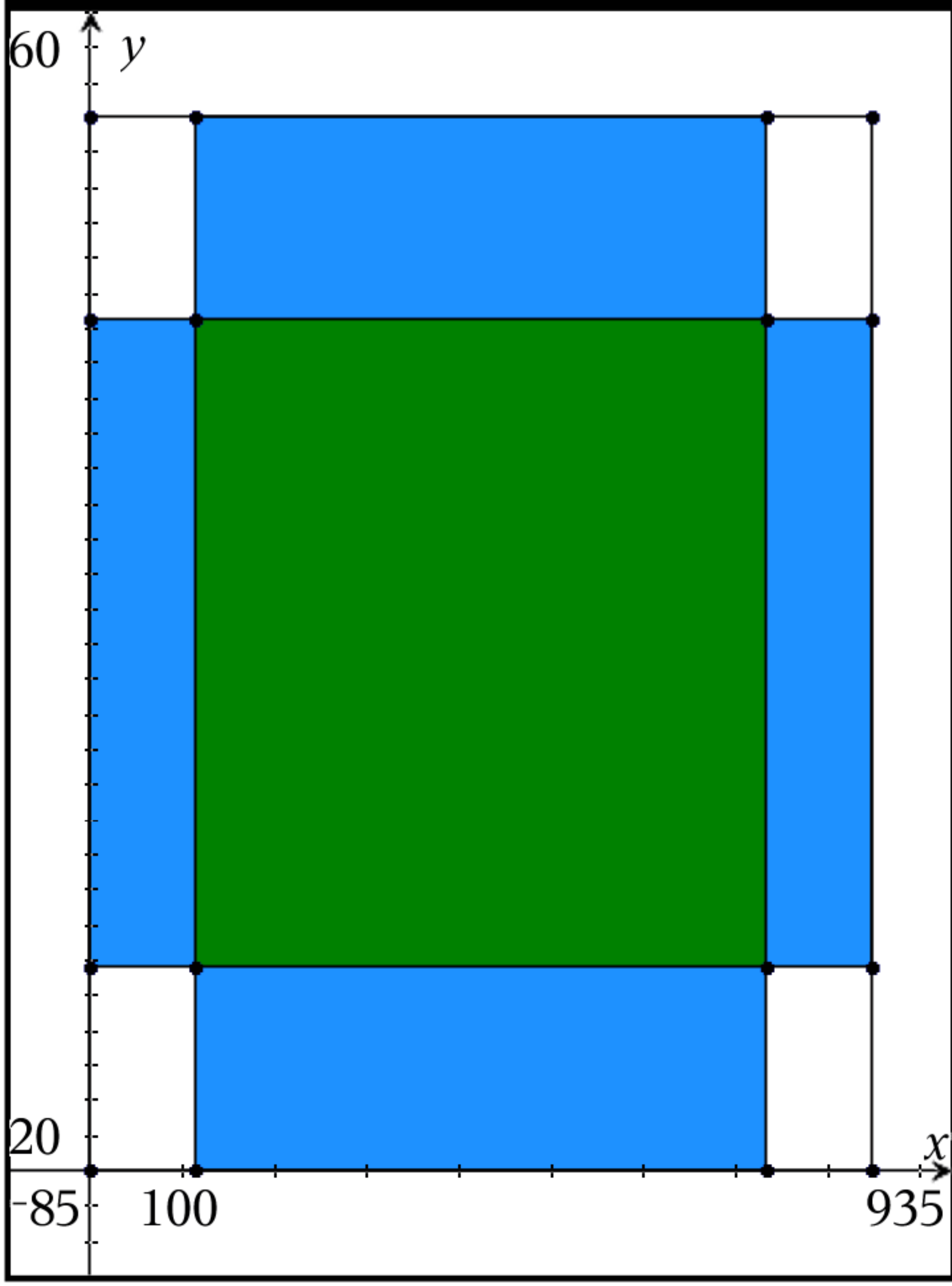
850 **by** 600

What is the FEASIBLE DOMAIN for x?

x $\in$(0,300)

Why?

The square corner cut needs to be less than $\frac{1}{2}$ of the smallest side of the sheet of the material given



What are the dimensions that will yield the maximum volume when you are making an open top rectangular box out of a sheet of material with dimensions 850 by 600 ?

Exact Dimensions

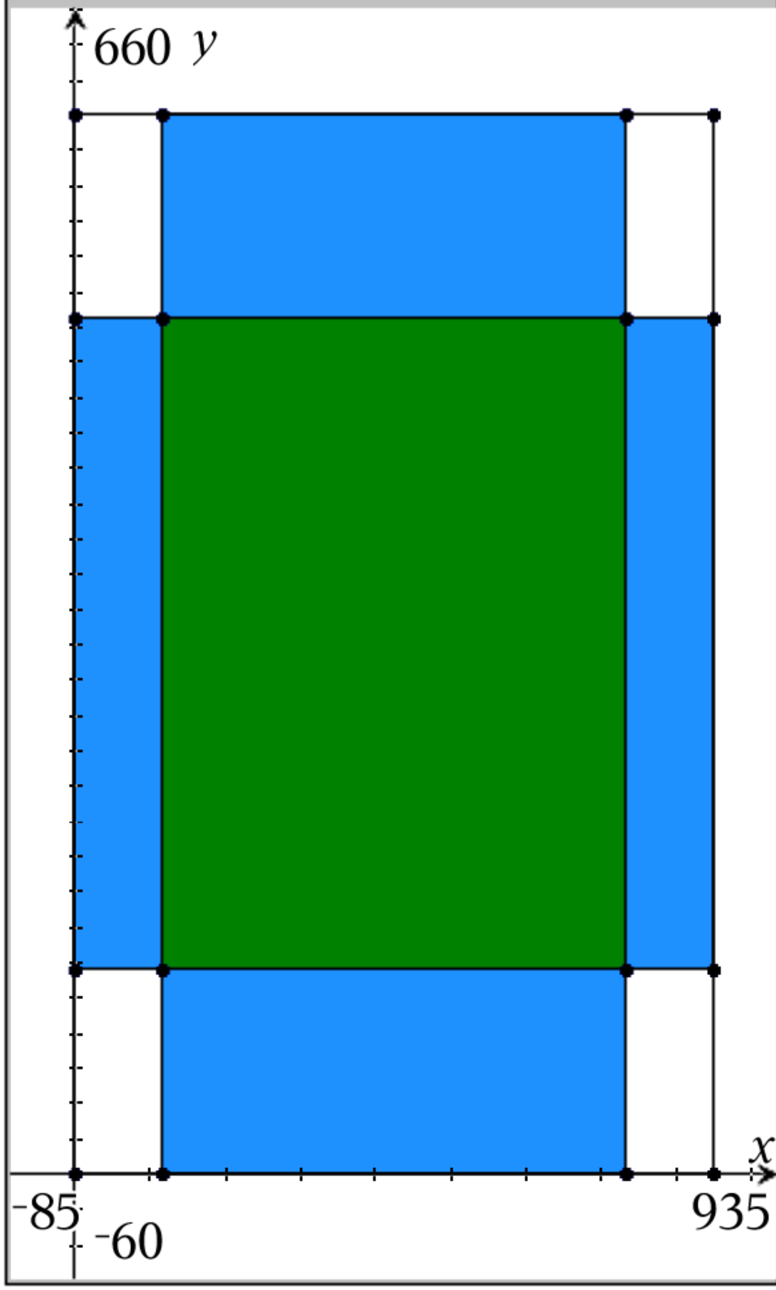
$\frac{50\cdot\sqrt{229}}{3}+\frac{1100}{3}$ **by** $\frac{50\cdot\sqrt{229}}{3}+\frac{350}{3}$ **by** $\frac{-25\cdot\left(\sqrt{229}-29\right)}{3}$

Approximate Dimensions

618.88 by 368.88 by 115.6

$\frac{dV}{dx}$ **at = 5.5**

V'(5.5)=478463.



What is the maximum volume when you are making an open top rectangular box out of a sheet of material with dimensions 850 by 600 ?

Exact Dimensions

$\frac{50\cdot\sqrt{229}}{3}+\frac{1100}{3}$ **by** $\frac{50\cdot\sqrt{229}}{3}+\frac{350}{3}$ **by** $\frac{-25\cdot(\sqrt{229}-29)}{3}$

Approximate Dimensions

618.88 by 368.88 by 115.6

EXACT Volume

$$\mathbf{V}\left(\frac{-25\cdot(\sqrt{229}-29)}{3}\right)=\frac{28625000\cdot\sqrt{229}}{27}+\frac{279125000}{27}$$

Approximate Volume

$\mathbf{V}(115.6)=26381476.03$

	A	B	C x_1	D y_1	E x_
=					
1	sheet length	850	0	0	
2	sheet width	600	0	49.9	x_te
3	_1	850−2*x	0	w_sheet−x_given	x_te
4	w_1	600−2*x	0	w_sheet	
5	h_1	x	x_given	0	
6	volume	4*x*(x−425)*(x−3..	49.9	49.9	
7	sa_1	510000−4*x^2	x_given	w_sheet−x_given	
8	sheet perimet...	2900	x_given	w_sheet	
9	sheet area	510000	l_sheet−x_given	0	
10	a_1	4	l_sheet−x_given	49.9	
11	p_1	2900	l_sheet−x_given	w_sheet−x_given	

A1 "sheet length "