Helpful formulas you should know by heart

Area of a Rectangle	Perimeter of a Rectangle	Surface Area of a	Volume of a Rectangular
LW	2L+2W	Rectangular Prism	Prism
		PH+2B	LWH
Circle Area	Circle Circumference	Surface Area of a Cylinder	Volume of a Cylinder
$\pi r^2$	$2\pi r = d\pi$	$2\pi rh+2\pi r^2$	$\pi r^2 h$
Surface Area of a Cone	Volume of a Cone	Surface Area of a Sphere	Volume of a Sphere
$\pi r \sqrt{r^2 + h^2} + \pi r^2$	$\frac{1}{3}\pi r^2h$	$4\pi r^2$	$\frac{4}{3}\pi r^3$

For each of the problems, you must clearly show your work, and support the determination of the answers through CALCULUS methods, failure to clearly show how the derivative impacts the problem solving process will greatly reduce available points

Scenario 1	Related picture	Related model
You are creating a rectangular box		
with an open top by cutting x by x		
corners from a piece of material that		
has dimensions 120 cm. by 500 cm.		
1. Determine the dimensions of		
the maximum volume of this		
box		
2 Determine the maximum		
volume of this box		
2 Determine the rate of change		
5. Determine the face of change		
1 F cm		
I.J CIII.	Deleted werk for determinetion of the	Deleted work for determinetion of the
Related work for determination of the	Related work for determination of the	Related work for determination of the
dimensions of the maximum volume	maximum volume of this box	rate of change of this box's volume
of this box		when x is 1.5 cm.

Scenario 2	Related picture	Related model
You are creating a box with an open		
ton that uses a right isoscoles triangle		
top that uses a right isosceles thangle		
as the base. You are only allowed a		
total of 1000 cm <sup>2</sup> worth of material to		
create this open top box. This		
material does NOT need to be cut		
from a single sheet of the material!		
1. Determine the dimensions of		
the maximum volume of this		
box		
2 Determine the maximum		
2. Determine the maximum		
volume of this box		
3. Determine the rate of change		
of this box's volume when one		
of the legs (congruent sides)		
of the base is 2 cm.		
Related work for determination of the	Related work for determination of the	Related work for determination of the
dimensions of the maximum volume	maximum volume of this box	rate of change of this box's volume
of this box		when y is 2cm
		when x is zeni.

Continuation of Scenario 1	Continuation of Scenario 2	
You are creating a rectangular box with an open top by	You are creating a box with an open top that uses a right	
cutting x by x corners from a piece of material that has	isosceles triangle as the base. You are only allowed a total	
dimensions m cm. by n cm.	of A cm <sup>2</sup> worth of material to create this open top box.	
1. Write a volume model for this GENERAL problem	This material does NOT need to be cut from a single sheet	
	of the material!	
	1. Write a volume model for this GENERAL problem	
dV	dV	
2. State $\frac{dx}{dx}$ for this general model assume m and h	2. State $\frac{d}{dx}$ for this general model assume A is	
are constants	constant	
<ol> <li>State the feasible domain for x (assume m &gt; n) for</li> </ol>		
this scenario.		

Constantin D	Deleted states	Deleted we del
Scenario 3	Related picture	Related model
You are creating a square and a circle		
out of a roll of wire. There is 100 feet		
of wire in the roll of wire		
1. Determine the dimensions of		
the square and the circle that		
would maximum the area		
enclosed by the square and		
the circle. Assume that you		
will use all of the wire with re		
will use all of the wife with ho		
waste.		
2. Determine the rate of change		
in the area enclosed by the		
figures when the radius is 2		
feet.		
Related work for determination of the	Related work for determination of the	Rate is the rate of change in the area
dimensions of both figures of the	maximum area enclosed by these	when the radius of the circle is 2 feet
maximum area	figures	
The side length of the environment of the star ill		
The side length of the square that will		
optimize the use of the wire is		
Exactly		
Approximately		
The radius of the circle that will		
ontimize the use of the wire is		
Evactly		
Approximately		

Scenario 4	Related picture	Related model
$\land$		
F		
You are creating a cone Determine		
the dimensions of the cone that will		
use a slant height of 10 cm, that will		
maximize the cone's volume.		
1. Determine the dimensions of		
the maximum volume of this		
box		
2. Determine the maximum		
volume of this box		
3. Determine the rate of change		
of this cone's volume when		
the height is 3 cm		
Related work for determination of the	Related work for determination of the	Related work for determination of the
dimensions of the maximum volume	maximum volume of this cone	rate of change of this cone's volume
of this cone		when h is 3 cm.

Continuation of Scenario 4

 Rewrite your volume model for the cone in terms of the OTHER variable. (this means that if you wrote V(h), then write V(r))

2. At what heights is the rate of change in volume negative (decreasing)?

3. At what radii is the rate of change in volume positive (increasing) ?

Helpful formulas you should know by heart

Area of a Rectangle	Perimeter of a Rectangle	Surface Area of a	Volume of a Rectangular
LW	2L+2W	Rectangular Prism	Prism
		PH+2B	LWH
Circle Area	Circle Circumference	Surface Area of a Cylinder	Volume of a Cylinder
$\pi r^2$	$2\pi r = d\pi$	$2\pi rh+2\pi r^2$	$\pi r^2 h$
Surface Area of a Cone	Volume of a Cone	Surface Area of a Sphere	Volume of a Sphere
$\pi r \sqrt{r^2 + h^2} + \pi r^2$	$\frac{1}{3}\pi r^2h$	$4\pi r^2$	$\frac{4}{3}\pi r^3$

For each of the problems, you must clearly show your work, and support the determination of the answers through CALCULUS methods, failure to clearly show how the derivative impacts the problem solving process will greatly reduce available points

Scenario 1	Related picture	Related model
You are creating a rectangular box		
with an open top by cutting x by x		
corners from a piece of material that		
has dimensions 420 cm. by 500 cm.		
1. Determine the dimensions of		
the maximum volume of this		
box		
2 Determine the maximum		
volume of this box		
3 Determine the rate of change		
of this boy's volume when y is		
2 E cm		
2.5 UII.	Deleted work for determinetion of the	Deleted work for determinetion of the
Related work for determination of the	Related work for determination of the	Related work for determination of the
dimensions of the maximum volume	maximum volume of this box	rate of change of this box's volume
of this box		when x is 2.5 cm.

Scenario 2	Related picture	Related model
You are creating a box with an open		
ton that uses a right isosceles triangle		
as the base. You are only allowed a		
as the base. You are only allowed a		
total of 2000 cm <sup>2</sup> worth of material to		
create this open top box. This		
material does NOT need to be cut		
from a single sheet of the material!		
1. Determine the dimensions of		
the maximum volume of this		
hox		
2 Determine the maximum		
2. Determine the maximum		
volume of this box		
3. Determine the rate of change		
of this box's volume when one		
of the legs (congruent sides)		
of the base is 5 cm.		
Related work for determination of the	Related work for determination of the	Related work for determination of the
dimensions of the maximum volume	maximum volume of this box	rate of change of this box's volume
of this box		when x is 5cm.

Continuation of Scenario 1	Continuation of Scenario 2	
You are creating a rectangular box with an open top by	You are creating a box with an open top that uses a right	
cutting x by x corners from a piece of material that has	isosceles triangle as the base. You are only allowed a total	
dimensions m cm. by n cm.	of A cm <sup>2</sup> worth of material to create this open top box.	
1. Write a volume model for this GENERAL problem	This material does NOT need to be cut from a single sheet	
	of the material!	
	1. Write a volume model for this GENERAL problem	
2. State $\frac{dV}{dV}$ for this second model assume m and m	$\frac{dV}{dV}$ for this concrete model accurate A is	
2. State $\frac{dx}{dx}$ for this general model assume m and n	2. State $\frac{dx}{dx}$ for this general model assume A is	
are constants	constant	
2. State the feasible domain for $y$ (assume $m > n$ ) for		
<ol> <li>State the reasible domain for x (assume m &gt; n) for this scenario</li> </ol>		

Scenario 3 You are creating a square and a circle out of a roll of wire. There is 200 feet of wire in the roll of wire 3. Determine the dimensions of the square and the circle that would maximum the area enclosed by the square and the circle. Assume that you will use all of the wire with no waste. 4. Determine the rate of change in the area enclosed by the figures when the radius is 3 feet.	Related picture	Related model
Related work for determination of the	Related work for determination of the	Rate is the rate of change in the area
dimensions of both figures of the	maximum area enclosed by these	when the radius of the circle is 3 feet
The side length of the square that will optimize the use of the wire is		
Exactly		
Approximately		
The radius of the circle that will optimize the use of the wire is		
Exactly		

Scenario 4	Related picture	Related model
$\land$		
12 cm.		
$  /  ^n \setminus$		
F		
You are creating a cone. Determine		
the dimensions of the cone that will		
use a slant height of 12 cm. that will		
maximize the cone's volume.		
4. Determine the dimensions of the maximum volume of this		
box		
5. Determine the maximum		
volume of this box		
6. Determine the rate of change		
of this cone's volume when		
Related work for determination of the	Related work for determination of the	Related work for determination of the
dimensions of the maximum volume	maximum volume of this cone	rate of change of this cone's volume
of this cone		when h is 4 cm.

Continuation of Scenario 4

 Rewrite your volume model for the cone in terms of the OTHER variable. (this means that if you wrote V(h), then write V(r))

2. At what heights is the rate of change in volume negative (decreasing)?

3. At what radii is the rate of change in volume positive (increasing) ?

Helpful formulas you should know by heart

Area of a Rectangle	Perimeter of a Rectangle	Surface Area of a	Volume of a Rectangular
LW	2L+2W	Rectangular Prism	Prism
		PH+2B	LWH
Circle Area	Circle Circumference	Surface Area of a Cylinder	Volume of a Cylinder
$\pi r^2$	$2\pi r = d\pi$	$2\pi rh+2\pi r^2$	$\pi r^2 h$
Surface Area of a Cone	Volume of a Cone	Surface Area of a Sphere	Volume of a Sphere
$\pi r \sqrt{r^2 + h^2} + \pi r^2$	$\frac{1}{3}\pi r^2h$	$4\pi r^2$	$\frac{4}{3}\pi r^3$

For each of the problems, you must clearly show your work, and support the determination of the answers through CALCULUS methods, failure to clearly show how the derivative impacts the problem solving process will greatly reduce available points

Scenario 1	Related picture	Related model
You are creating a rectangular box		
with an open top by cutting x by x		
corners from a piece of material that		
has dimensions 850 cm. by 600 cm.		
1. Determine the dimensions of		
the maximum volume of this		
box		
2 Determine the maximum		
volume of this box		
3 Determine the rate of change		
of this boy's volume when y is		
E E cm		
S.S CIII.	Deleted work for determination of the	Delated work for determination of the
dimensions of the maximum volume	maximum valuma of this hav	rate of change of this hov's volume
of this have	maximum volume of this box	rate of change of this box's volume
of this box		when x is 5.5 cm.

Scenario 2	Related picture	Related model
You are creating a box with an open		
ton that uses a right isosceles triangle		
as the base. You are only allowed a		
as the base. Fou are only allowed a		
total of 4000 cm <sup>-</sup> worth of material to		
create this open top box. This		
material does NOT need to be cut		
from a single sheet of the material!		
1. Determine the dimensions of		
the maximum volume of this		
box		
2. Determine the maximum		
volume of this box		
3 Determine the rate of change		
of this boy's volume when one		
of the loss (congruent sides)		
of the legs (congruent sides)		
of the base is 8 cm.		
Related work for determination of the	Related work for determination of the	Related work for determination of the
dimensions of the maximum volume	maximum volume of this box	rate of change of this box's volume
of this box		when x is 8 cm.

Continuation of Scenario 1	Continuation of Scenario 2	
You are creating a rectangular box with an open top by	You are creating a box with an open top that uses a right	
cutting x by x corners from a piece of material that has	isosceles triangle as the base. You are only allowed a total	
dimensions m cm. by n cm.	of A cm <sup>2</sup> worth of material to create this open top box.	
1. Write a volume model for this GENERAL problem	This material does NOT need to be cut from a single sheet	
	of the material!	
	1. Write a volume model for this GENERAL problem	
2 State $\frac{dV}{dt}$ for this general model assume m and n	2 State $\frac{dV}{dt}$ for this general model assume A is	
$\frac{dx}{dx}$	$\frac{dx}{dx}$	
are constants	constant	
3 State the feasible domain for x (assume $m > n$ ) for		
this scenario.		

Companie 2	Delete durieture	Deleted weedel
Scenario 3 You are creating a square and a circle out of a roll of wire. There is 400 feet of wire in the roll of wire 1. Determine the dimensions of the square and the circle that would maximum the area enclosed by the square and the circle. Assume that you will use all of the wire with no waste. 2. Determine the rate of change in the area enclosed by the figures when the radius is 4 feet.	Related picture	Related model
dimensions of both figures of the	maximum area enclosed by these	when the radius of the circle is 4 foot
maximum area	figures	
The side length of the square that will optimize the use of the wire is		
Exactly		
The radius of the circle that will		
optimize the use of the wire is		
Approximately		

Scenario 4	Related picture	Related model
$\wedge$		
15 cm.		
6		
You are creating a cone Determine		
the dimensions of the cone that will		
use a slant height of 15 cm. that will		
maximize the cone's volume.		
1. Determine the dimensions of		
the maximum volume of this		
DOX 2 Determine the maximum		
2. Determine the maximum volume of this box		
3. Determine the rate of change		
of this cone's volume when		
the height is 5 cm		
Related work for determination of the	Related work for determination of the	Related work for determination of the
dimensions of the maximum volume	maximum volume of this cone	rate of change of this cone's volume
of this cone		when h is 5 cm.

Continuation of Scenario 4

 Rewrite your volume model for the cone in terms of the OTHER variable. (this means that if you wrote V(h), then write V(r))

2. At what heights is the rate of change in volume negative (decreasing)?

3. At what radii is the rate of change in volume positive (increasing) ?