Name_______________________________________Quiz Optimization through Calculus Methods 1-18-19

Helpful formulas you should know by heart

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

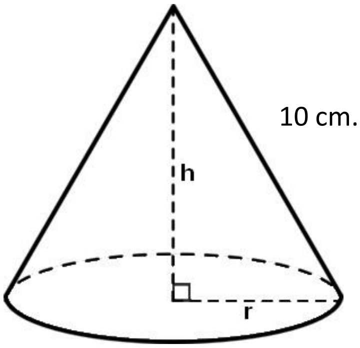
For each of the problems, you must clearly show your work, and support the determination of the answers through CALCULUS methods, failure to clearly show how the derivative impacts the problem solving process will greatly reduce available points

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 3. Determine the rate of change of this box's volume when x is 1.5 cm.		
Related work for determination of the dimensions of the maximum volume of this box	Related work for determination of the maximum volume of this box	Related work for determination of the rate of change of this box's volume when x is 1.5 cm.

Scenario 2	Related picture	Related model
You are creating a box with an open top that uses a right isosceles triangle as the base. You are only allowed a total of 1000 cm^2 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 box's volume when one of the legs (congruent sides) of the base is 2 cm.		
Related work for determination of the dimensions of the maximum volume of this box	Related work for determination of the maximum volume of this box	Related work for determination of the rate of change of this box's volume when x is 2cm.

Continuation of Scenario 1	Continuation of Scenario 2
You are creating a rectangular box with an open top by cutting x by x corners from a piece of material that has dimensions m cm. by n cm. 1. Write a volume model for this GENERAL problem 2. State $\frac{dV}{dx}$ for this general model assume m and n are constants 3. State the feasible domain for x (assume m > n) for this scenario.	You are creating a box with an open top that uses a right isosceles triangle as the base. You are only allowed a total of A cm^2 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. Write a volume model for this GENERAL problem 2. State $\frac{dV}{dx}$ for this general model assume A is constant

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 no 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 dimensions of both figures of the maximum area 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 _____________ Approximately ________________	Related work for determination of the maximum area enclosed by these figures	Rate is the rate of change in the area when the radius of the circle is 2 feet

Scenario 4	Related picture	Related model
 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 dimensions of the maximum volume of this cone	Related work for determination of the maximum volume of this cone	Related work for determination of the rate of change of this cone's volume when h is 3 cm.

Continuation of Scenario 4

1. 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) ?

Name______________________________________Quiz Optimization through Calculus Methods 1-18-19

Helpful formulas you should know by heart

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

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 box's volume when x is 2.5 cm.		
Related work for determination of the dimensions of the maximum volume of this box	Related work for determination of the maximum volume of this box	Related work for determination of the rate of change of this box's volume when x is 2.5 cm.

Scenario 2	Related picture	Related model
You are creating a box with an open top that uses a right isosceles triangle as the base. You are only allowed a total of 2000 cm^2 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 box's volume when one of the legs (congruent sides) of the base is 5 cm.		
Related work for determination of the dimensions of the maximum volume of this box	Related work for determination of the maximum volume of this box	Related work for determination of the rate of change of this box's volume when x is 5cm.

Continuation of Scenario 1	Continuation of Scenario 2
You are creating a rectangular box with an open top by cutting x by x corners from a piece of material that has dimensions m cm. by n cm. 1. Write a volume model for this GENERAL problem 2. State $\frac{dV}{dx}$ for this general model assume m and n are constants 3. State the feasible domain for x (assume m > n) for this scenario.	You are creating a box with an open top that uses a right isosceles triangle as the base. You are only allowed a total of A cm^2 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. Write a volume model for this GENERAL problem 2. State $\frac{dV}{dx}$ for this general model assume A is constant

<table>
<tr><td>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.</td><td>Related picture</td><td>Related model</td></tr>
<tr><td>Related work for determination of the dimensions of both figures of the maximum area

The side length of the square that will optimize the use of the wire is

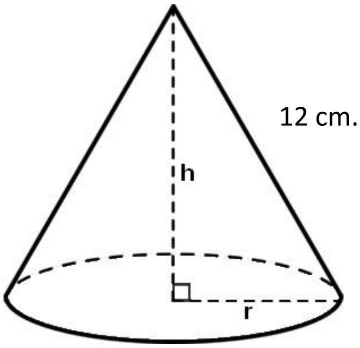
Exactly _____________

Approximately ________________

The radius of the circle that will optimize the use of the wire is

Exactly _____________

Approximately ________________</td><td>Related work for determination of the maximum area enclosed by these figures</td><td>Rate is the rate of change in the area when the radius of the circle is 3 feet</td></tr>
</table>

<table>
<tr>
<td>Scenario 4


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 the height is 4 cm</td>
<td>Related picture</td>
<td>Related model</td>
</tr>
<tr>
<td>Related work for determination of the dimensions of the maximum volume of this cone</td>
<td>Related work for determination of the maximum volume of this cone</td>
<td>Related work for determination of the rate of change of this cone's volume when h is 4 cm.</td>
</tr>
</table>

Continuation of Scenario 4

1. 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) ?

Name______________________________________Quiz Optimization through Calculus Methods 1-18-19

Helpful formulas you should know by heart

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

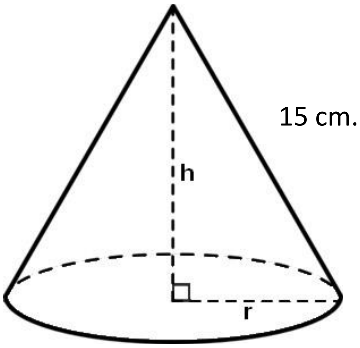
For each of the problems, you must clearly show your work, and support the determination of the answers through CALCULUS methods, failure to clearly show how the derivative impacts the problem solving process will greatly reduce available points

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 box's volume when x is 5.5 cm.		
Related work for determination of the dimensions of the maximum volume of this box	Related work for determination of the maximum volume of this box	Related work for determination of the rate of change of this box's volume when x is 5.5 cm.

Scenario 2	Related picture	Related model
You are creating a box with an open top that uses a right isosceles triangle as the base. You are only allowed a total of 4000 cm^2 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 box's volume when one of the legs (congruent sides) of the base is 8 cm.		
Related work for determination of the dimensions of the maximum volume of this box	Related work for determination of the maximum volume of this box	Related work for determination of the rate of change of this box's volume when x is 8 cm.

Continuation of Scenario 1	Continuation of Scenario 2
You are creating a rectangular box with an open top by cutting x by x corners from a piece of material that has dimensions m cm. by n cm. 1. Write a volume model for this GENERAL problem 2. State $\frac{dV}{dx}$ for this general model assume m and n are constants 3. State the feasible domain for x (assume m > n) for this scenario.	You are creating a box with an open top that uses a right isosceles triangle as the base. You are only allowed a total of A cm^2 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. Write a volume model for this GENERAL problem 2. State $\frac{dV}{dx}$ for this general model assume A is constant

Scenario 3	Related picture	Related model
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 work for determination of the dimensions of both figures of the maximum area 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 _____________ Approximately ________________	Related work for determination of the maximum area enclosed by these figures	Rate is the rate of change in the area when the radius of the circle is 4 feet

Scenario 4	Related picture	Related model
 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 box 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 dimensions of the maximum volume of this cone	Related work for determination of the maximum volume of this cone	Related work for determination of the rate of change of this cone's volume when h is 5 cm.

Continuation of Scenario 4

1. 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) ?