Problem Set 4 Name:_____
Math 196L Spring 2017

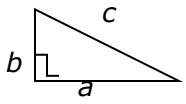
**INSTRUCTIONS TO BE PREPARED FOR CLASS:**

**FILL IN THE FIRST PAGE AND TOP OF PAGE 2 WITH ALL THE CORRECT FORMULAS.**

Equation of a circle: _____ $r$ is the radius and $(h, k)$ is the center

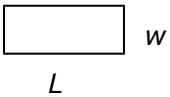
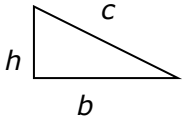
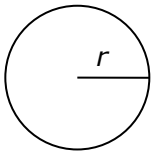
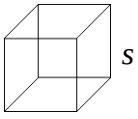
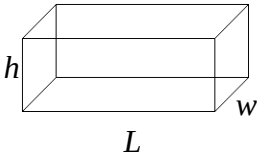
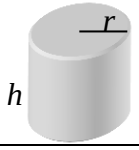
Distance of a line segment $(x_1, y_1)$ and $(x_2, y_2)$ is _____

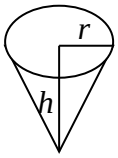
Midpoint between two points $(x_1, y_1)$ and $(x_2, y_2)$ is _____




Pythagorean Theorem _____ solve for $c$ and then solve for $b$.

$c =$ _____ $b =$ _____

| Shape | image | Area | Perimeter |
|---|---|---|---|
| Square |   | $A =$ | $P =$ |
| Rectangle |   | $A =$ | $P =$ |
| Rt. Triangle |   | $A =$ | $P =$ |
| Circle |   | $A =$ | $C =$ |
| Cube |   | $V =$ | *SurfaceArea* = |
| Box |   | $V =$ | *SurfaceArea* = |
| Right Cylinder |   | $V =$ | *SurfaceArea* = |

| | | | |
|---|---|---|---|
| Right Cone |   | $V =$ | $SurfaceArea = \pi r^2 + \pi r\sqrt{r^2 + h^2}$ (*usually given*) |

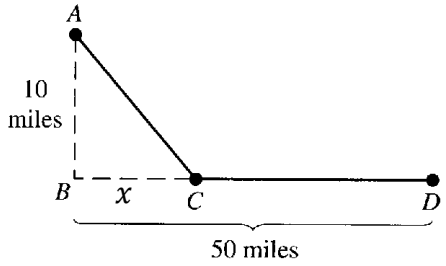
*Sphere* $V=$ *Surface Area*

Read these over but we will set these up in class. Interpret story problems into mathematical equations. Use variables given or if not given use appropriate variables and declare their representation. **Do not solve.**

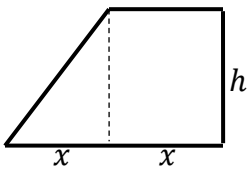
1. The perimeter of a rectangle is 200 inches. Express the length as a function of width.

2. If the area of a rectangle is 45 square meters, write the perimeter of the rectangle in terms of the width only.

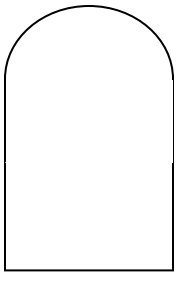
3. An offshore oil rig is located at point A, which is 10 miles out to sea. An oil pipline is to be constructed from point *A* to a point *C* on the shore and then to a point *D*, farther up the coast. If it costs \$7 million per mile to lay the pipeline in the sea and \$1.5 million per mile on land, express the cost of laying the pipeline in terms of *x*, where *x* is the distance from *B* to *C*.




4. Given the object below, express the perimeter in terms of $x$ only given that the area of the triangular section is 50 $in^2$.

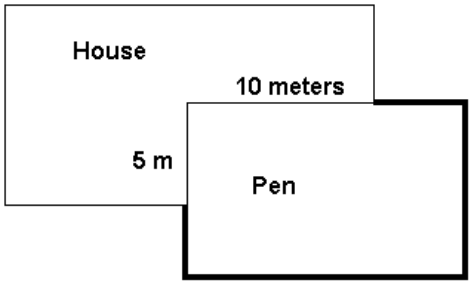



5. A window consisting of a rectangle topped by a semicircle is to have a perimeter, 100 inches. Express the area of window in terms of the radius of the semicircle.

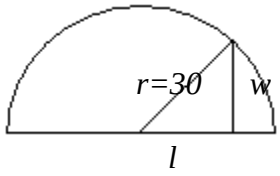


6. A square base box has a volume of 500 $ft^3$. The **cost** of the material for the top and bottom (square base) of the box is \$18 per $ft.^2$. The cost for the sides is \$3 per $ft.^2$. Express the total cost of this box in terms of one of the lengths of the base.

7. A rectangular outdoor pen is to be added to one of the zoo's animal houses. If 85 meters of new fence is available, express the area of the pen in terms of the largest length of the pen. You can assume that the fence is not needed along the walls of the house.

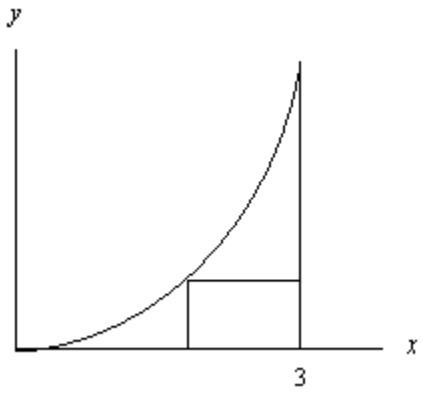



8. A <u>rectangular</u> dance floor of width *w* and length *L* feet is to be built inside a semicircular part of a room of radius 30 feet. Express the area of the rectangle in terms of the width. *l* starts from the center of the circle.




9. A Florida citrus grower estimates that if 150 orange trees are planted, the average yield per tree will be 500 oranges. The average yield per tree will decrease by 10 oranges for each additional tree planted on the same acreage. Express the total yield as a function of the number of trees greater than 150 trees planted.

10. A rectangle with its base on the *x*-axis is inscribed in the region bounded by its base, the curve $f(x) = x^2$, and the line $x = 3$. The drawing is given below. Express the area of the rectangle in terms of *x* only.




11. A square and a circle have a combined linear length of 20 inches.

(i) Express the total combine Area in terms of the radius of the circle.

(ii) Express the total combine Area in terms the one side of the square.

(iii) Express the total combine Area in terms of the Circumference of the circle.

12. A rectangular box with a square bottom has a fixed volume *V*. It must be constructed from 3 different kinds of materials. The material used for the 4 sides costs \$1.50 $ft^2$, the bottom material costs \$3 $ft^2$, and the material for the top costs \$2 $ft^2$. Write the total cost of this box in terms of *V* and base, *x*, only.

13. A line is drawn from the origin *O* to a point $P(x, y)$ in the first quadrant on the graph on the graph of $y = \frac{1}{x^2}$. From point *P*, a line is drawn perpendicular to the *x*-axis, meeting the *x*-axis at the point *B*.

Express the area of the $\Delta OPB$ as a function of *x*.

Express the perimeter of the $\Delta OPB$ as a function of *x*.