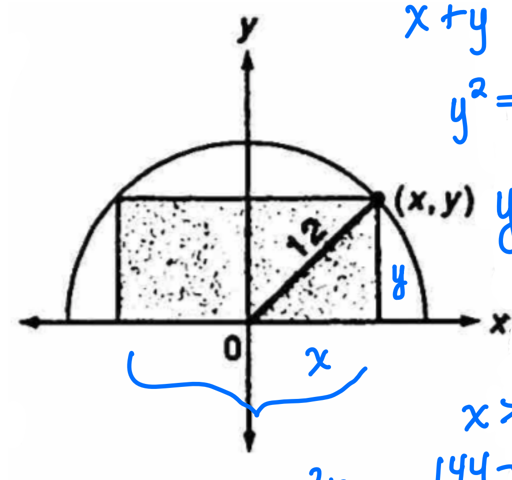
Name: ______________________________ Date: ____________

PCH: Modeling with Functions Practice Packet 4 Ms. Loughran

1. A rectangle is inscribed in a semicircle of radius 12 as shown. Express the area of the rectangle as a function of x.



$A = lw$

$A(x) = 2x \cdot \sqrt{144 - x^2}$, $0 < x < 12$

$x^2 + y^2 = 12^2$

$y^2 = 144 - x^2$

$y = \pm\sqrt{144 - x^2}$

$2x$

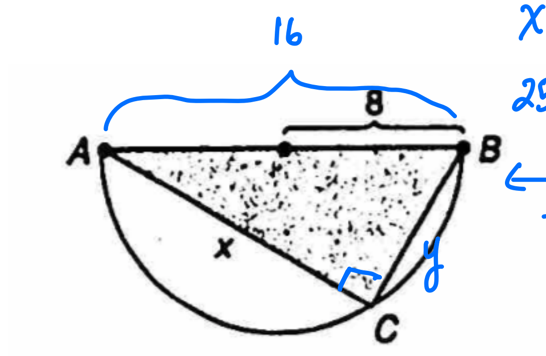
$x > 0$

$144 - x^2 > 0$

$-$ -12 $+$ 12 $-$

$-12 < x < 12$

2. Triangle ABC is inscribed in a semicircle of radius 8 so that one of its sides coincides with a diameter. Express the area of the triangle as a function of $x = AC$.



$A = \frac{1}{2}bh$

$A(x) = \frac{1}{2}x \cdot \sqrt{256 - x^2}$, $0 < x < 16$

$x > 0$

$256 - x^2 > 0$

-16 16

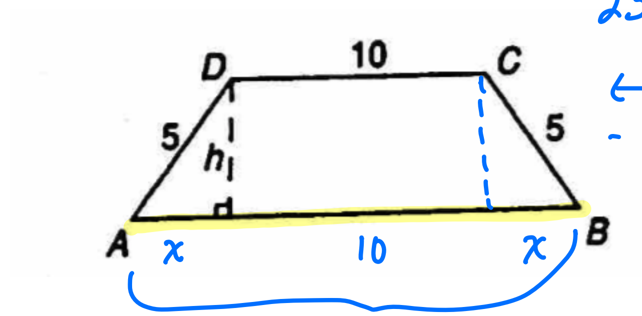
$-16 < x < 16$

$x^2 + y^2 = 16^2$

$y^2 = 256 - x^2$

$y = \pm\sqrt{256 - x^2}$

3. *ABCD* is an isosceles trapezoid in which sides *AB* and *DC* are parallel. Express the area of the trapezoid as a function of altitude *h*.



$h>0$

$25-h^2>0$

$-5<x<5$

$A=\frac{1}{2}h(b_1+b_2)$

$A(h)=\frac{1}{2}h(10+10+2\sqrt{25-h^2})$

$A(h)=\frac{1}{2}(20+2\sqrt{25-h^2})$

$A(h)=10+\sqrt{25-h^2}$

$0<h<5$

$x^2+h^2=5^2$

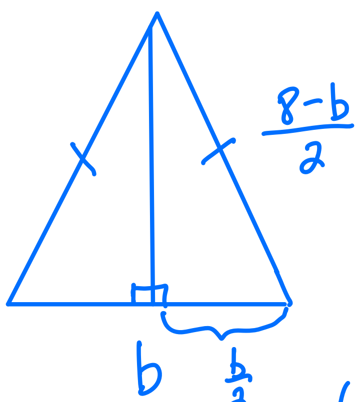
$x^2=25-h^2$

$x=\pm\sqrt{25-h^2}$

$10+2x$

$10+2\sqrt{25-h^2}$

4. An isosceles triangle has a perimeter of 8cm. Express the area *A* of the triangle as a function of the length *b* of the base of the triangle.



$A=\frac{1}{2}bh$

$A(b)=\frac{1}{2}b\cdot(2\sqrt{4-b})$, $0<b<4$

$A(b)=b\sqrt{4-b}$

$\text{leg}=\frac{8-b}{2}$

$\left(\frac{b}{2}\right)^2+h^2=\left(\frac{8-b}{2}\right)^2$

$\frac{b^2}{4}+h^2=\frac{(8-b)^2}{4}$

$h^2=\frac{(8-b)^2}{4}-\frac{b^2}{4}$

$h^2=\frac{(8-b)^2-b^2}{4}$

$h=\pm\sqrt{\frac{(8-b)^2-b^2}{4}}$

$b>0$

$4-b>0$

$-b>-4$

$b<4$

$h=\sqrt{\frac{64-16b+\cancel{b^2}-\cancel{b^2}}{4}}$

$h=\sqrt{\frac{\cancel{16}^{4}(4-b)}{\cancel{4}}}$

$h=\sqrt{4(4-b)}=2\sqrt{4-b}$

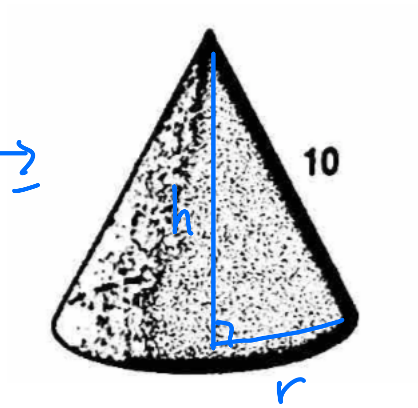
5. The figure shows a right circular cone in which r is the radius of the base, and the slant height is 10. Express the volume of the cone as a function of r.

$r > 0$

$100 - r^2 > 0$

$-10 \quad + \quad 10$

$-10 < r < 10$



$V = \frac{1}{3}\pi r^2 h$

$V(r) = \frac{1}{3}\pi r^2 \cdot \sqrt{100 - r^2}, \quad 0 < r < 10$

$r^2 + h^2 = 10^2$

$h^2 = 100 - r^2$

$h = \pm\sqrt{100 - r^2}$