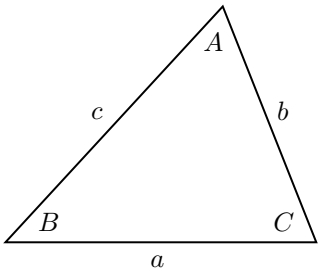
Pre-Calculus Exercises

A. Prove the following identities.

1. $\tan(x+y) = \frac{\tan(x)+\tan(y)}{1-\tan(x)\tan(y)}$
2. $\sin(3x) = 3\sin(x) - 4\sin(x)^3$
3. $\cos(x)\cos(y) = \frac{\cos(x-y)+\cos(x+y)}{2}$

B. Refer to the diagram of the triangle. Find the indicated value for each given set of angle and side measurements. Then find the area of the triangle.



1. $a = 6$, $B = \pi/2$, $A = \pi/4$, $c =$?
2. $a = 1$, $b = 1$, $C = \pi/3$, $c =$?
3. $A = \pi/2$, $b = 3$, $C = \pi/4$, $a =$?
4. $C = \pi/2$, $a = 1$, $b = 1$, $c =$?
5. $a = b = c = 1$, $A =$?

C. Draw the following sets on a number line.

1. $(0,3) \cup (4,6)$
2. $[0,5] \cap (1,10]$
3. $\{2x \ : \ x \in \mathbb{R}\} \cap (0,10)$
4. $\{x^2 \ : \ x \in \mathbb{R}\} \cup (0,1)$
5. $\{x \in \mathbb{R} \ : \ x^2 - 4 < 0\}$
6. $\{x \in \mathbb{R} \ : \ x^2 > 0\}$

D. For each real-function, state the (largest possible) domain and range. State whether the function is injective, surjective, and/or bijective. Then find a restricted domain and codomain on which the function is invertible, and find its inverse.

1. $f(x) = \sqrt{x}$
2. $f(x) = x^3$
3. $f(x) = x^4$
4. $f(x) = \frac{1}{x+1}$
5. $f(x) = \frac{x}{x^2+x}$
6. $f(x) = \cos(x)$
7. $f(x) = \tan(x)$
8. $f(x) = \csc(x)$
9. $f(x) = \log_2(x)$