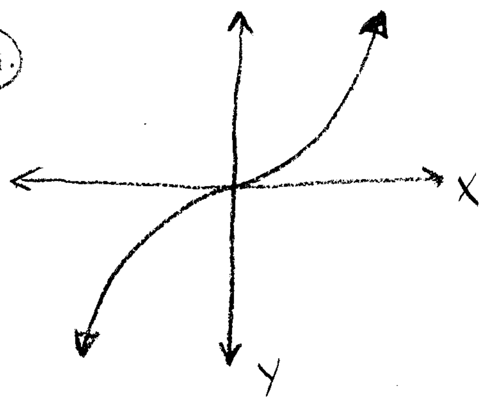
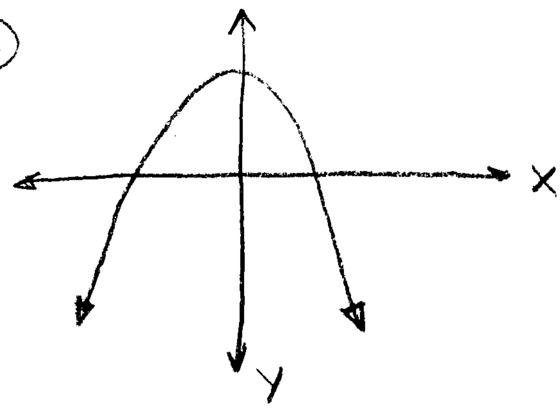
BE-Alg 2 | Tuesday 12-6-11

(1.) Which function has an inverse which is also a function? That is, which function is a One-to-One function?

(A.)



(B)



These examples are on page 392

Homework review: Pg. 393 # 8-11.

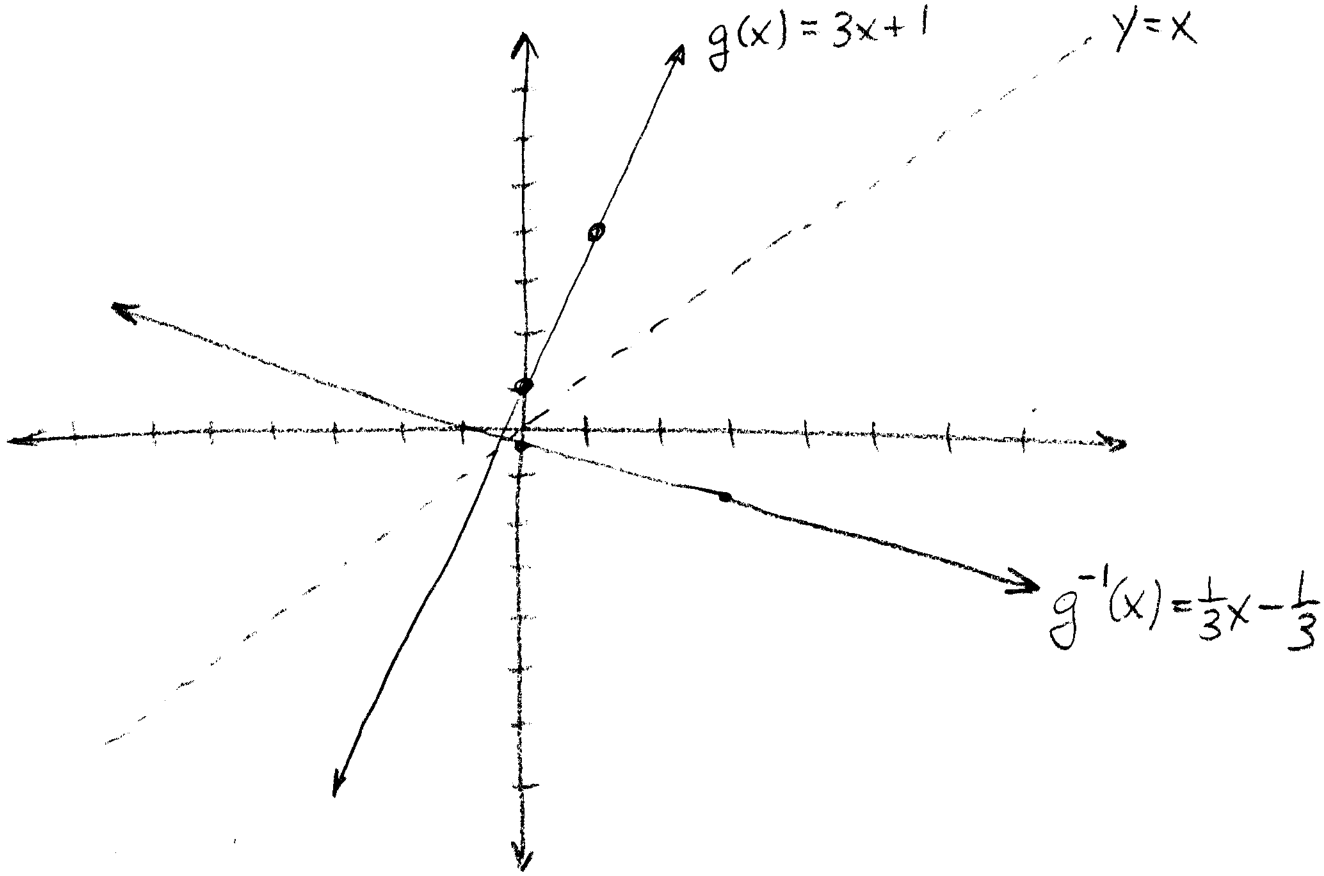
(8.) $g(x) = 3x + 1$ Find $g^{-1}(x)$

$y = 3x + 1 \Rightarrow x = 3y + 1$ SWAP $x \leftrightarrow y$

$x - 1 = 3y$

$\therefore \boxed{y = \frac{x-1}{3} = g^{-1}(x)}$

or $y = \frac{1}{3}x - \frac{1}{3}$

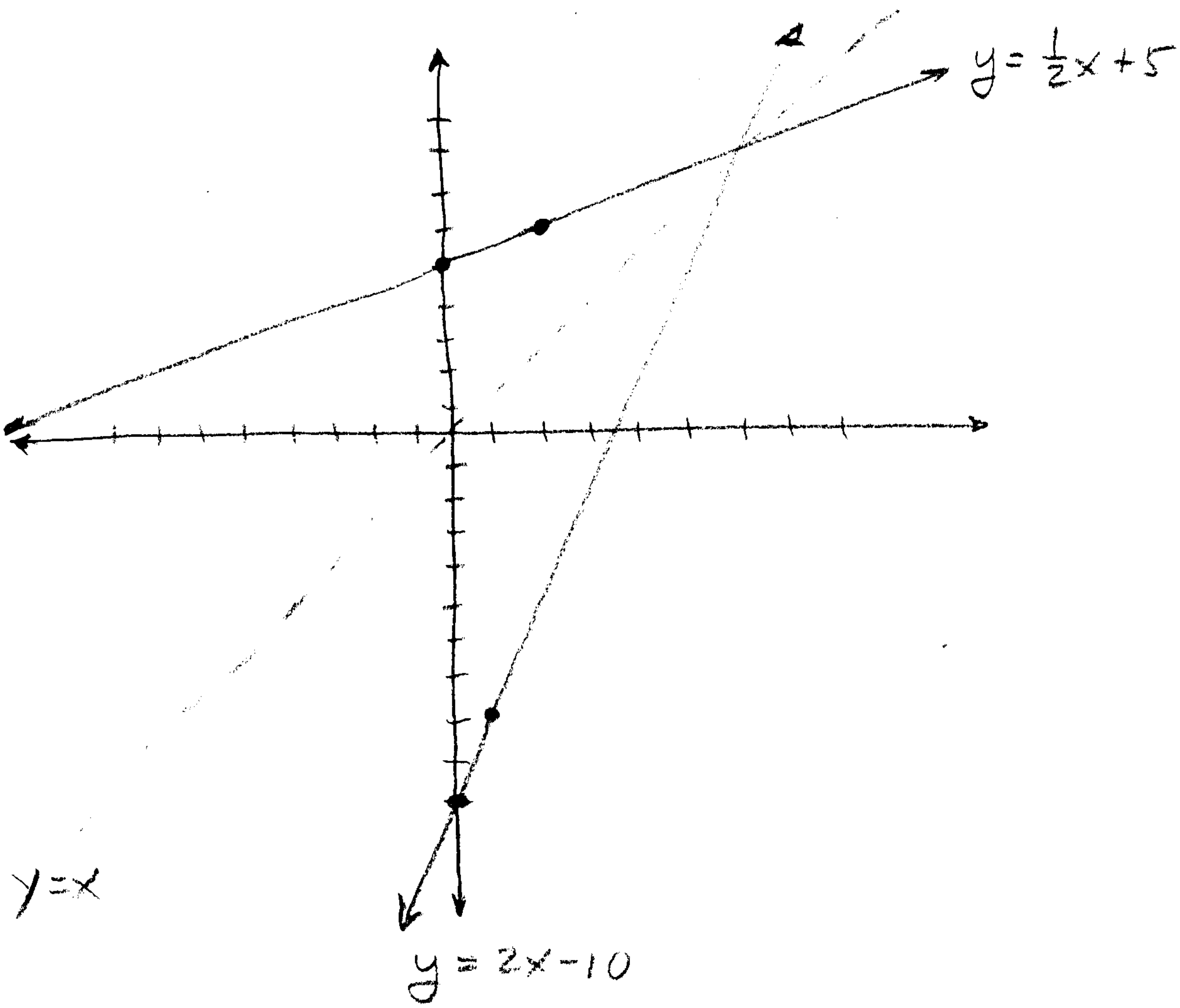


$f(x)$ $\qquad\qquad\qquad\qquad$ $f'(x)$

9. $\boxed{y=\frac{1}{2}x+5} \Rightarrow x=\frac{1}{2}y+5$ SWAP $X \leftrightarrow Y$

$$2(x-5)=\frac{1}{2}y \cdot 2$$

$$\boxed{2x-10=y=f'(x)}$$



(10.) $f(x) = x + 7$

$g(x) = x - 7$

$(f \circ g)(x)$

$f(x) = x + 7$

$f(x-7) = (x-7) + 7$

$= x$ ✓

$(g \circ f)(x)$

$g(x) = x - 7$

$g(x+7) = (x+7) - 7$

$= x$ ✓

YES, THEY ARE INVERSE FUNCTIONS

(11) $g(x) = 3x - 2$ $\quad f(x) = \dfrac{x-2}{3}$

$(g \circ f)(x)$

$g(x) = 3x - 2$

$g\left(\frac{x-2}{3}\right) = \cancel{3}\left(\frac{x-2}{\cancel{3}}\right) - 2$

$= x - 2 - 2$

$= x - 4$

$\neq$

NOT X

$(f \circ g)(x)$

$f(x) = \dfrac{x-2}{3}$

$f(3x-2) = \dfrac{(3x-2) - 2}{3}$

$= \dfrac{3x-4}{3}$

$= x - \frac{4}{3}$

$\neq$

NOT X

NO, NOT INVERSE FUNCTIONS

$\boxed{\text{Look at Problems 38-40 on Pg 394}}$

Pick number between 1-20 $\Rightarrow$ say X

Add 7 $\Rightarrow$ $X+7$

Mult. By 4 $\Rightarrow$ $4(X+7)$

Minus 6 $\Rightarrow$ $4(X+7)-6$

$\div$ by 2 $\Rightarrow$ $\boxed{\dfrac{4(X+7)-6}{2} = y}$ Result $= 35$

Find inverse $\Rightarrow$ y^{-1}

$$\frac{4(y+7)-6}{2} = x$$

$$\frac{4y+28-6}{2} = x$$

$$2y+11 = x$$

$$\boxed{y^{-1} = \frac{x-11}{2}}$$

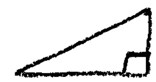
Use result in y^{-1} to find original number

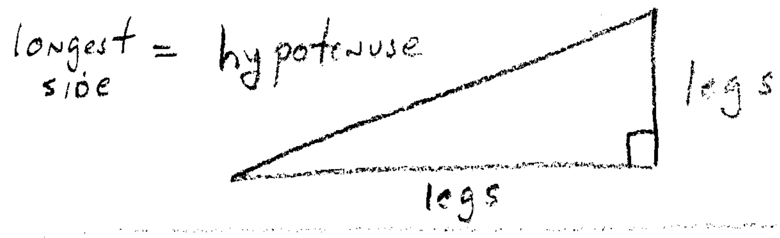
$$y = \frac{35-11}{2} = \frac{24}{2} = \boxed{12}$$

original number

Ch. 13-1 Right Triangle Trigonometry

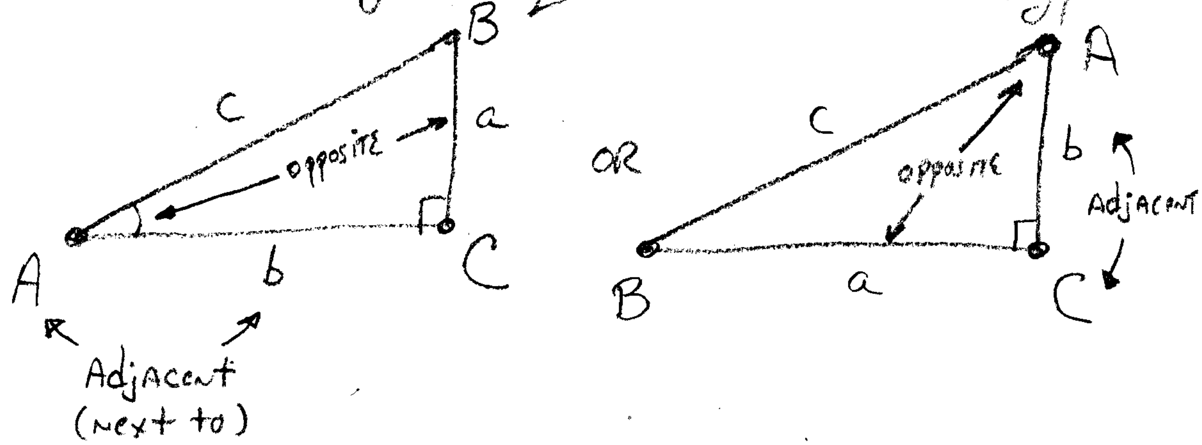
Right Triangle Vocabulary And Conventions & Properties

"∟" 90° symbol Ex 

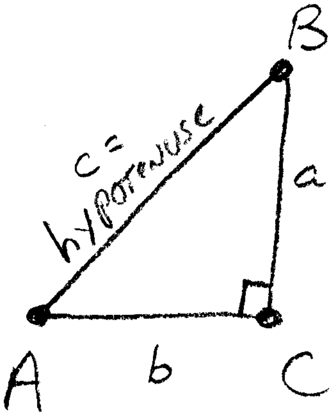


Every right triangle has ONE 90° angle (90°) and two acute (<90°) angles. The two acute angles Always add to 90° and together with the 90° angle = 180°

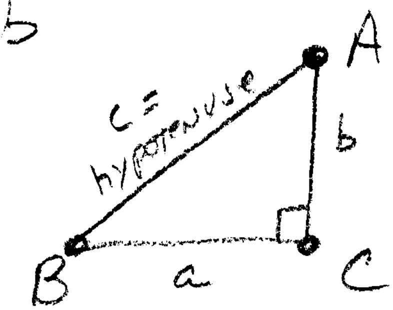
A, B, C = vertices or the angles (degrees)
a, b, c = sides (length)
C = the 90° angle by convention ∴ c = hypotenuse



- Adjacent and opposite are never used to describe the hypotenuse. The hypotenuse is called the... hypotenuse.

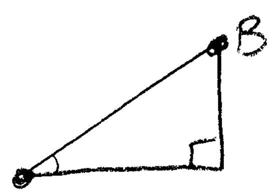


- ∠A is always opposite side a (and adjacent to side b) (Angle A)
- ∠B is always opposite side b (and adjacent to side a)

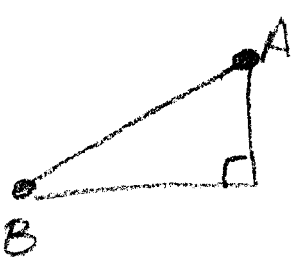


In any right triangle, once you know <u>ONE</u> acute angle - you know all 3 angles.

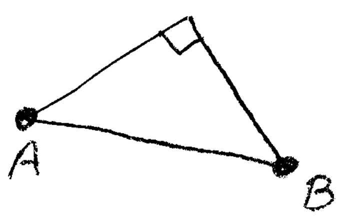
EX Name the missing ∠ value



A = 40°
B = ?
C = ?



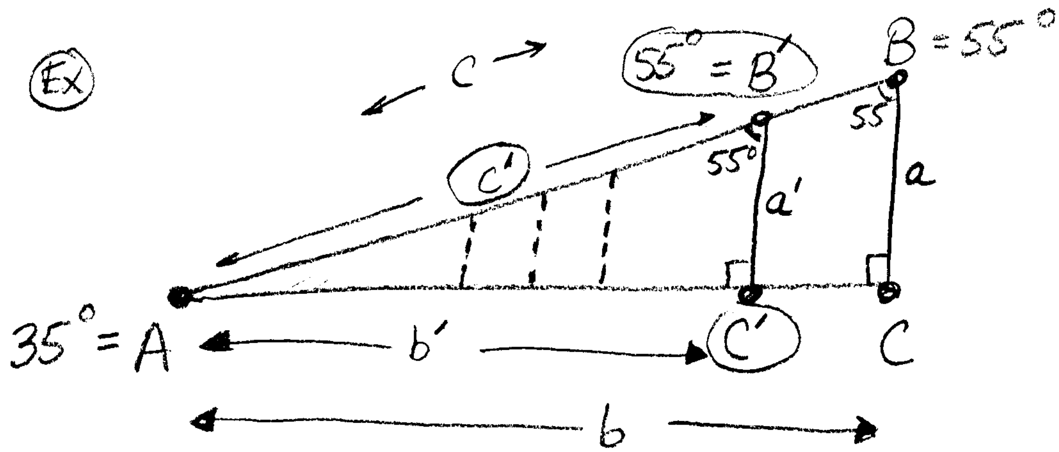
A = 10°
B = ?
C = ?



A = 45°
B = ?
C = ?

Because knowing the value of 1 acute angle "fixes" the value of the other two angles, for any given acute angle, say 35°, the ratio of side lengths of all 35°, 55°, 90° triangles are the same:

(Ex)



- infinite number of 35°-55°-90° triangles but the ratio of sides is always the same number

For $A = 35°$, $\frac{a}{c} = \frac{a'}{c'} = \frac{\text{any } a}{\text{any } c} \cong .5736$

$$\frac{b}{c} = \frac{b'}{c'} = \frac{\text{any } b}{\text{any } c} \cong .8192$$

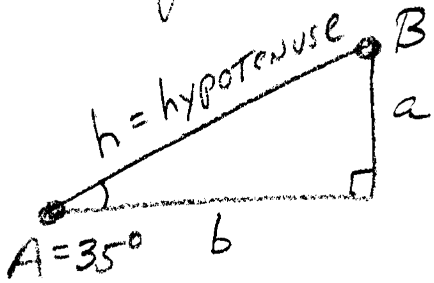
$$\frac{a}{b} = \frac{a'}{b'} = \frac{\text{any } a}{\text{any } b} \cong .7002$$

$\frac{\text{rise}}{\text{run}}$ of A = slope, slope of 45° = 1

slope of 35° = < 1 but close

Since, for any particular acute angle in a right triange the ratio of the lengths of the sides are always the same, we name and define them.

For this example:



SINE = $\sin A = \sin 35^\circ = \dfrac{\text{opposite}}{\text{hypotenuse}} = \dfrac{o}{h} \cong .5736$ SOH

COSINE = $\cos A = \cos 35^\circ = \dfrac{\text{Adjacent}}{\text{hypotenuse}} = \dfrac{a}{h} \cong .8192$ CAH

tangent (slope) = $\tan A = \tan 35^\circ = \dfrac{\text{opposite}}{\text{Adjacent}} = \dfrac{o}{a} \cong .7002$ TOA

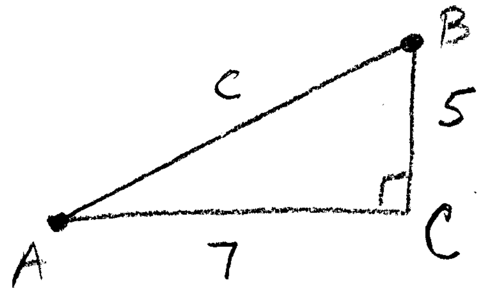
For any right triangle, where θ (theta = greek letter) is an acute $\angle$

$\sin\theta = \dfrac{o}{h} \qquad \cos\theta = \dfrac{a}{h} \qquad \tan\theta = \dfrac{o}{a}$

$$\boxed{\text{SOH} \qquad \text{CAH} \qquad \text{TOA}}$$

Find: sin, cos, tan 35° from: table (handout)
calculator
(bring ACT calculator)

EX Find sin, cos, tan for $\angle A$ and $\angle B$
(find exact value = simplified fraction, then compare with value from table & calculator)



$c^2 = a^2 + b^2 \quad \therefore \quad c^2 = 49 + 25$

$c = \sqrt{74} \sim 8.6023$

$\sin A = \frac{o}{h} = \underbrace{\boxed{\frac{5}{\sqrt{74}}}}_{\text{EXACT}} = \frac{5}{\sqrt{74}} \cdot \frac{\sqrt{74}}{\sqrt{74}} = \underbrace{\boxed{\frac{5\sqrt{74}}{74}}}_{\text{EXACT}}$

"RATIONALIZED"
NO $\sqrt{\ }$ in bottom

$\cong \frac{5}{8.6023} \cong \boxed{.5812}$ Approximate

$\cos A = \frac{a}{h} = \frac{7}{\sqrt{74}} = \underbrace{\boxed{\frac{7\sqrt{74}}{74}}}_{\text{EXACT}} \cong \frac{7}{8.6023} = \underbrace{\boxed{.8137}}_{\text{Approximate}}$

$\tan A = \frac{o}{a} = \underbrace{\boxed{\frac{5}{7}}}_{\text{EXACT}} \cong \underbrace{\boxed{.7142}}_{\text{APPROXIMATE}}$

$\sin B = \frac{7}{\sqrt{74}} \qquad \cos B = \frac{5}{\sqrt{74}}$ See above for EXACT and Approximate

* NEW CAREFUL $\tan B = \text{SLOPE } B = \frac{o}{a} = \underbrace{\boxed{\frac{7}{5}}}_{\text{EXACT}} = \underbrace{\boxed{1.4}}_{\text{EXACT}}$ WHY is ONE tan >1 AND ONE is <1 ?

If $\sin A \cong .5812$ CAN you FIND $\angle A$?

Using table $\Rightarrow$ find A SIN VALUE OF .5812 (closest to it) And read Angle $\cong$ $\underline{\underline{36^\circ}}$

The process of going backward from the value of the sin to the Angle is called finding the inverse of the sin $\Rightarrow \sin^{-1} A$

$\underline{\underline{OR}}$ Sometimes it is called the ARC SIN A $\therefore \sin^{-1}(.5812) = \arcsin(.5812) = 36^\circ$

$\therefore \angle B = 90 - 36 = 54^\circ$

The "reciprocal" trig. functions

$$\sin\theta = \frac{O}{H} \qquad \boxed{\csc\theta = \frac{H}{O}} = \text{COSECANT}$$

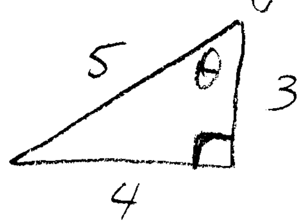
$$\underline{\underline{\text{OR}}} \quad \frac{1}{\sin\theta} = \frac{1}{\frac{O}{H}} = \frac{H}{O}$$

$$\cos\theta = \frac{a}{H} \qquad \boxed{\sec\theta = \frac{H}{a}} = \text{SECANT}$$

$$\underline{\underline{\text{OR}}} \quad \frac{1}{\cos\theta} = \frac{1}{\frac{a}{H}} = \frac{H}{a}$$

$$\tan\theta = \frac{O}{A} \qquad \boxed{\cot\theta = \frac{A}{O}} \qquad \text{Cotangent}$$

Ex 1 Pg 702 Find all 6 trig. functions for θ



$$\sin\theta = \frac{4}{5} \quad \therefore \quad \csc\theta = \frac{5}{4}$$

$$\cos\theta = \frac{3}{5} \quad \therefore \quad \sec\theta = \frac{5}{3}$$

$$\tan\theta = \frac{4}{3} \quad \therefore \quad \cot\theta = \frac{3}{4}$$

Homework: Pg. 706 # 2, 4–6, 15