Trig Rummy

Objective: the player will practice and gain facility with trigonometric identities and calculus relations.

Players: 2-4

Goal: get the most cards in play.

Set up: randomize cards and deal 7 cards to each player. (You may want to introduce the game with only 4 cards as 7 is overwhelming.)

Play: On your turn you may do one of:

- take any card from the discard pile (not just the top card).
- draw a new card.

After that you may do either or both of:

- pick up any sets you have.
- play any new sets you have.

At the end of your turn, if you did not play a set, discard a card.

Special:

- if at any point the discard pile contains a complete set, the first player to otice can cal "Rummy!" and take the set out to play for themselves.
- you can not play matching operator cards, like a pair of d/dx cards.
- There is a wild card, which you can choose to be -1× (times -1), or d/dx, or $\int \cdot\, dx$.

End: After the last card is drawn from the deck, each player gets one more turn from the discard pile. Then the cards are counted up and the player with the most cards played wins. No penalty for unplayed cards.

Variation: Play until one player is out.

Example plays:

- Play $\sin^2(x)$ matching $1 - \cos^2(x)$.
- Play d/dx with $\sin(x)$ matching $\cos(x)$.
- Play $\int \cdot\, dx$ with $\sec(x)\tan(x)$ matching d/dx with $\ln|\sec(x) + \tan(x)|$ (since both are equal to $\sec(x)$.)

If a player lays a mistaken combination and no one catches it before the next player's turn, they stay in play but turned face down. If someone does catch it, that player has to pick up the pair.

Feel free to use a trig cheat sheet.

A.) $\cos^2 x + \sin^2 x = 1$

B.) $\sin 2x = 2\sin x \cos x$

C.) $\cos 2x = 2\cos^2 x - 1$ so that $\cos^2 x = \frac{1+\cos 2x}{2}$

D.) $\cos 2x = 1 - 2\sin^2 x$ so that $\sin^2 x = \frac{1-\cos 2x}{2}$

E.) $\cos 2x = \cos^2 x - \sin^2 x$

F.) $1 + \tan^2 x = \sec^2 x$ so that $\tan^2 x = \sec^2 x - 1$

G.) $1 + \cot^2 x = \csc^2 x$ so that $\cot^2 x = \csc^2 x - 1$

$D(\sin x) = \cos x$

$D(\cos x) = -\sin x$

$D(\tan x) = \sec^2 x$

$D(\cot x) = -\csc^2 x$

$D(\sec x) = \sec x \tan x$

$D(\csc x) = -\csc x \cot x$

- 1.) $\int \cos x \; dx \; = \; \sin x + C$
- 2.) $\int \sin x \; dx \; = \; -\cos x + C$
- 3.) $\int \sec^2 x \; dx \; = \; \tan x + C$
- 4.) $\int \csc^2 x \; dx \; = \; -\cot x + C$
- 5.) $\int \sec x \tan x \; dx \; = \; \sec x + C$
- 6.) $\int \csc x \cot x \; dx \; = \; -\csc x + C$
- 7.) $\int \tan x \; dx \; = \; \ln|\sec x| + C$
- 8.) $\int \cot x \; dx \; = \; \ln|\sin x| + C$
- 9.) $\int \sec x \; dx \; = \; \ln|\sec x + \tan x| + C$
- 10.) $\int \csc x \; dx \; = \; \ln|\csc x - \cot x| + C$

Each trigonometric function in terms of the other five. [4]

Function	(sinθ)	(cosθ)	(tanθ)	(cscθ)	(secθ)	(cotθ)
sinθ =	$\sin\theta$	$\pm\sqrt{1-\cos^2\theta}$	$\pm\frac{\tan\theta}{\sqrt{1+\tan^2\theta}}$	$\frac{1}{\csc\theta}$	$\pm\frac{\sqrt{\sec^2\theta-1}}{\sec\theta}$	$\pm\frac{1}{\sqrt{1+\cot^2\theta}}$
cosθ =	$\pm\sqrt{1-\sin^2\theta}$	$\cos\theta$	$\pm\frac{1}{\sqrt{1+\tan^2\theta}}$	$\pm\frac{\sqrt{\csc^2\theta-1}}{\csc\theta}$	$\frac{1}{\sec\theta}$	$\pm\frac{\cot\theta}{\sqrt{1+\cot^2\theta}}$
tanθ =	$\pm\frac{\sin\theta}{\sqrt{1-\sin^2\theta}}$	$\pm\frac{\sqrt{1-\cos^2\theta}}{\cos\theta}$	$\tan\theta$	$\pm\frac{1}{\sqrt{\csc^2\theta-1}}$	$\pm\sqrt{\sec^2\theta-1}$	$\frac{1}{\cot\theta}$
cscθ =	$\frac{1}{\sin\theta}$	$\pm\frac{1}{\sqrt{1-\cos^2\theta}}$	$\pm\frac{\sqrt{1+\tan^2\theta}}{\tan\theta}$	$\csc\theta$	$\pm\frac{\sec\theta}{\sqrt{\sec^2\theta-1}}$	$\pm\sqrt{1+\cot^2\theta}$
secθ =	$\pm\frac{1}{\sqrt{1-\sin^2\theta}}$	$\frac{1}{\cos\theta}$	$\pm\sqrt{1+\tan^2\theta}$	$\pm\frac{\csc\theta}{\sqrt{\csc^2\theta-1}}$	$\sec\theta$	$\pm\frac{\sqrt{1+\cot^2\theta}}{\cot\theta}$
cotθ =	$\pm\frac{\sqrt{1-\sin^2\theta}}{\sin\theta}$	$\pm\frac{\cos\theta}{\sqrt{1-\cos^2\theta}}$	$\frac{1}{\tan\theta}$	$\pm\sqrt{\csc^2\theta-1}$	$\pm\frac{1}{\sqrt{\sec^2\theta-1}}$	$\cot\theta$