Name: _____ Collaborators: _____

Trigonometry

1. Fill in the following table, using the five standard angles in the first quadrant.

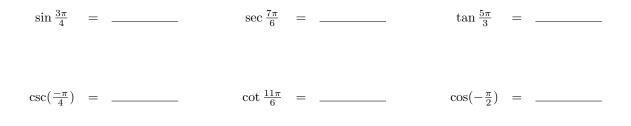
Angle, θ		$\sin \theta$	$\cos heta$	$\tan \theta$
deg	rad			

2. Sketch the graphs of sine, cosine, and tangent from -2π to 2π . Make sure you have the x-intercepts, max and min values (for sine and cosine), and vertical asymptotes (for tangent).

3. Write each trig function in terms of $\sin x$, $\cos x$, and/or $\tan x$.

$\sec x$	=	 $\csc x$	=	
$\tan x$	=	 $\cot x$	=	

4. Make sure to know how to evaluate the trig functions at angles in all four quadrants. For example:



5. State the Pythagorean Identity (for sine and cosine).

Exponential Growth and Decay

6. Make sure to know the domain, range, y-intercept, horizontal asymptote, and end behavior of the function $f(x) = e^x$.

Sketch and label graphs of e^x and e^{-x} . Make sure to include the *y*-intercepts, horizontal asymptotes, and end behavior.

The Natural Logarithm

7. Evaluating the natural logarithm:

 $\ln(1) =$ ____ $\ln(e) =$ ____ $\ln(e^2) =$ ____ $\ln(\sqrt{e}) =$ ____

8. Make sure to know the domain, range, x-intercept, vertical asymptote, and end behavior of the function $f(x) = \ln x$.

Sketch and label the graphs of $\ln(x)$ and $\ln |x|$. Make sure to include *x*-intercepts, vertical asymptotes, and end behavior.

Recall: For a function f(x), the graph of y = f(|x|) is made up of two pieces: the graph of y = f(x) for $x \ge 0$ and its mirror image across the y-axis.

Derivatives of Simple Functions.

• Constant Functions: c (not depending on x). Examples f(x) = 5, g(x) = e, $h(x) = \ln(2)$.

$$\frac{d}{dx}c =$$

- Power Functions: x^a . Examples: x^3 , $x^{2/3} = \sqrt[3]{x^2}$, $x^{-4} = 1/x^4$.
 - $\frac{d}{dx}x^a =$
- Exponential and Logarithmic Functions: b^x and $\log_b x$, for b > 0; especially when b = e.

$$\frac{d}{dx}e^x =$$

$$\frac{d}{dx}b^x =$$

 $\frac{d}{dx} \ln x =$

 $\frac{d}{dx} \log_b x =$

- Trigonometric Functions:
 - $\frac{d}{dx} \sin x =$ $\frac{d}{dx} \cos x =$ $\frac{d}{dx} \tan x =$ $\frac{d}{dx} \sec x =$ $\frac{d}{dx} \csc x =$ $\frac{d}{dx} \csc x =$ $\frac{d}{dx} \cot x =$

• Inverse Trigonometric Functions:

$$\frac{d}{dx}\sin^{-1}x = \frac{d}{dx}\arcsin x =$$

$$\frac{d}{dx} \tan^{-1} x = \frac{d}{dx} \arctan x =$$

Differentiation Rules. Suppose c is a constant and f and g are differentiable functions.

• Constant Multiple Rule, Sum and Difference Rules:

$$\frac{d}{dx} c \cdot f(x) =$$

$$\frac{d}{dx}\left(f(x) \pm g(x)\right) =$$

• Product and Quotient Rules:

$$\frac{d}{dx} f(x) \cdot g(x) =$$

$$\frac{d}{dx} \frac{f(x)}{g(x)} =$$

• Chain Rule:

$$\frac{d}{dx} f(g(x)) =$$

Simple Antiderivatives.

• Constant Functions: c (not depending on x),

$$\int c \, dx =$$

• Some Power Functions: $x^a (a \neq -1)$,

$$\int x^a dx =$$

- Exponential Functions: b^x , for b > 0,
 - $\int e^x dx =$

$$\int b^x dx =$$

• The Reciprocal Function: $1/x = x^{-1}$

$$\int \frac{1}{x} dx =$$

• Trigonometric Functions:

 $\int \sin x \, dx =$

 $\int \cos x \, dx =$

 $\int \sec^2 x \, dx =$

 $\int \csc^2 x \, dx =$

 $\int \sec x \tan x \, dx =$

 $\int \csc x \cot x \, dx =$

• Derivatives of Inverse Trigonometric Functions:

$$\int \frac{1}{\sqrt{1-x^2}} \, dx =$$

$$\int \frac{1}{1+x^2} \, dx =$$

Simple Substitution (Undoing the Chain Rule): $\int f(w(x)) w'(x) dx = \int f(w) dw$

• $\int (3x+4)^8 dx =$

•
$$\int \frac{1}{1-2x} \, dx =$$

•
$$\int \frac{x}{1+x} dx =$$

•
$$\int_0^{\sqrt{\pi}} x \sin(x^2) dx =$$

•
$$\int \frac{2x}{(x^2+1)^2} dx =$$

•
$$\int_0^{\pi/2} \sin^4(x) \cos(x) \, dx =$$