Proof Of Identity
ProofOfIdentity.tns

Name ___________________________

Class ___________________________

Problem 1 – Reciprocal Identities

- $\csc(x) = \dfrac{1}{\sin(x)}$
- $\sec(x) =$
- $\cot(x) =$
- $\sin(x) =$
- $\cos(x) =$
- $\tan(x) =$

Problem 2 – Negative Angle Identities

Page 2.2 shows the unit circle and defines the three basic trig functions in terms of *x*, *y* and *r*. Follow these steps to prove the negative angle identities.

1. Reflect the segment labeled *r* over the *x*-axis. Label its image *r'*.
2. The angle formed by the *x*-axis and *r'* has the same measure as the angle formed by the *x*-axis and *r*, but in the other direction. Therefore its measure is $-\theta$. Label the angle.
3. Use the **Coordinates and Equations** tool to find the coordinates of the point (*x*, *y*) and the coordinates of its reflected image.
4. Drag the point (*x*, *y*) and observe how the coordinates of the point and its image point change. What do you notice? Write an expression for the coordinates of the image point in terms of *x* and *y*.
5. Using this expression and the definitions of the basic trigonometric functions shown on the screen, write an expressions for sin(–*x*). Substitute sin(*x*) for $\frac{y}{r}$ to get sin(–*x*) = sin(*x*).
6. Repeat Step 5 to find an expression for cos(–*x*) in terms of cos(*x*) and tan(–*x*) in terms of tan(*x*).

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

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Problem 3 – Cofunction Identities

Page 3.2 shows a right triangle and defines the three basic trigonometric functions in terms of the lengths of its sides. Follow these steps to prove the cofunction identities.

1. Use the **Angle** tool from the Measurement menu to measure each angle of the triangle.
2. How are the two acute angles in a right triangle related? Use your answer to write an expression for β in terms of α. (We are working with radians, so use $\frac{\pi}{2}$ instead of 90°.)
3. Use the **Calculate** tool to evaluate the expression. Choose the measurement of α when prompted. If your expression was correct, it should equal the measure of β.
4. Use the definition of sine as $\frac{\text{opposite}}{\text{hypotenuse}}$ to write an expression for the sin(β).

   Substitute $\frac{\pi}{2} - \alpha$ for β and cos(α) for $\frac{a}{r}$ to get $\sin(x) = \cos\left(\frac{\pi}{2} - x\right)$.
5. Repeat Step 4 to write expressions for cos(x) and tan(x).

   - $\sin(x) = \cos\left(\frac{\pi}{2} - x\right)$
   - cos(x) =
   - tan(x) =

Problem 4 – Pythagorean Identities

Page 4.3 shows a right triangle and defines the three basic trigonometric functions in terms of the lengths of its sides. Follow these steps to prove the Pythagorean identities.

1. Divide both sides of the Pythagorean Formula by a^2 as shown.
2. Simplify the result. Substitute tan(θ) for $\frac{b}{a}$ and sec(θ) for $\frac{c}{a}$ to yield $\tan^2(x) = \sec^2(x) - 1$.
3. Repeat Steps 1 and 2, dividing by b^2 and c^2 to yield additional identities.
   - $\tan^2(x) = \sec^2(x) - 1$
   - 1 + _____ = ______
   - $\sin^2(x)$ + ____= _____