Math 132 - October 11, 2017
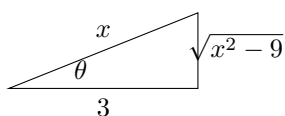
Sections Covered: 7.3 Trig Substitution

1. Determine the correct trig substitution.

2. Substitute (don't forget dx, $d\theta$)

3. Simplify and integrate.

4. Definite Integral: change limits.

5. Indefinite: draw the trig subsitution triangle. Get x's back.

Expression	Substitution	Identity
$\sqrt{a^2 - x^2}$	$x = a\sin\theta$	$1 - \sin^2\theta = \cos^2\theta$
$\sqrt{a^2 + x^2}$	$x = a\tan\theta$	$1 + \tan^2\theta = \sec^2\theta$
$\sqrt{x^2 - a^2}$	$x = a\sec\theta$	$\sec^2\theta - 1 = \tan^2\theta$

Warm-up Problems

1. Given the triangle below, find the values of the trig functions asked for.

  (a) $\sin\theta$

  (b) $\cos\theta$

  (c) $\tan\theta$

  (d) $\csc\theta$

  (e) $\sec\theta$

  (f) $\cot\theta$

2. **Clicker** Starting with the expression below you are to make a substitution that will eliminate the square root. Choose the best substitution.

$$x\sqrt{1 - x^2}$$

  (a) $x = \sin\theta$ (b) $x = \cos\theta$ (c) $x = \tan\theta$ (d) $x = \sec\theta$

3. **Clicker** Starting with the expression below you are to make a substitution that will eliminate the square root. Choose the best substitution.

$$\frac{x^2}{\sqrt{x^2 - 1}}$$

  (a) $x = \sin\theta$ (b) $x = \cos\theta$ (c) $x = \tan\theta$ (d) $x = \sec\theta$

4. **Clicker** Starting with the expression below you are to make a substitution that will eliminate the square root. Choose the best substitution.
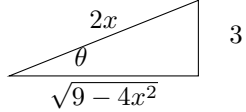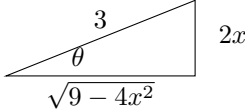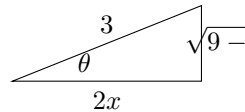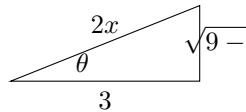
$$\frac{\sqrt{1 + x^2}}{x^2}$$

  (a) $x = \sin\theta$ (b) $x = \cos\theta$ (c) $x = \tan\theta$ (d) $x = \sec\theta$

Class Problems

5. Integrate $\displaystyle\int \frac{\sqrt{9-4x^2}}{x}\,dx$

(a) **Clicker** Using the chart, determine the best substitution
A. $x = 3\sin\theta$ B. $x = \frac{3}{2}\sin\theta$ C. $x = 3\sec\theta$ D. $x = \frac{3}{2}\sec\theta$ E. $x = 3\tan\theta$

(b) **Clicker** Draw the triangle associated to your substitution.

A.	B.	C.	D.

(c) Using your triangle, find the following.

    i. $\sin\theta$

    ii. $\cos\theta$

    iii. $\tan\theta$

    iv. $\csc\theta$

    v. $\sec\theta$

    vi. $\cot\theta$

(d) Compute the integral

6. More trig substitution practice:

(a) $\displaystyle\int \frac{dx}{(x^2+9)^{3/2}}$

(b) $\displaystyle\int \frac{\sqrt{25x^2-4}}{x}\,dx =$

(c) $\displaystyle\int_{2/5}^{4/5} \frac{\sqrt{25x^2-4}}{x}\,dx$