## Useful Trigonometric Identities for MA 114

The following are some trig identities that are particularly helpful for integration problems. You should know these for the exam.

• Pythagorean Theorem Identities. The second and third identities here can be derived from the first by dividing by  $\sin^2(x)$  or  $\cos^2(x)$ . These are useful for any integral involving trig functions or trig substitutions.

$$-\sin^2(x) + \cos^2(x) = 1$$

$$-\tan^2(x) + 1 = \sec^2(x)$$

- $-1 + \cot^2(x) = \csc^2(x)$
- Double Angle Formulas The second two of these identities are usually useful for integrating expressions with an even power of sin(x) and cos(x). The first two are usually useful for simplifying your final answer and converting back to the original variable in a trig substitution problem. Sometimes the second two are also useful for the integration step, though this is rarer.

$$-\sin(2x) = 2\sin(x)\cos(x)$$
  

$$-\cos(2x) = \cos^2(x) - \sin^2(x) = 2\cos^2(x) - 1 = 1 - 2\sin^2(x)$$
  

$$-\sin^2(x) = \frac{1}{2}(1 - \cos(2x))$$
  

$$-\cos^2(x) = \frac{1}{2}(1 + \cos(2x))$$

You can derive the third and fourth identities above from the second one by rearranging.