MATH 152

Today

1. Brief exam discussion
2. 6.2 Trigonometric integrals

Goals:

1. 6.2 Trigonometric Integrals (Understand how to employ trig identities to simplify integrands)
2. 6.2 Trigonometric Substitution (Understand how to take advantage of Pythagorean identities to express algebraic integrands in terms of trig functions)

Where is today's material used?

1. Physics: distance traveled by a particle (among many others)
2. Chemistry: fraction of gas molecules that can participate in a reaction (among many others)
3. Economics: finding total cost given marginal cost (among many others)
4. Any discipline that includes a notion of accumulated change.

6.2 Trig Integrals

1. Important trig identities (for integrals with trig functions):
   (a) (Pythagorean) $\sin^2(A) + \cos^2(A) = 1$
   (b) (Pythagorean) $\tan^2(A) + 1 = \sec^2(A)$
   (c) (Double) $\cos(2A) = \cos^2(A) - \sin^2(A)$
   (d) (Double) $\sin(2A) = 2\sin(A)\cos(A)$
   (e) (Sum) $\cos(A + B) = \cos(A)\cos(B) - \sin(A)\sin(B)$

(f) (Sum) $\sin(A+B) = \sin(A)\cos(B) + \cos(A)\sin(B)$

(g) (Square) $\sin^2(A) = \dfrac{1-\cos(2A)}{2}$

(h) (Square) $\cos^2(A) = \dfrac{1+\cos(2A)}{2}$

(i) (Product) $\cos(A)\cos(B) = \dfrac{1}{2}(\cos(A-B)+\cos(A+B))$ [Provided]

(j) (Product) $\sin(A)\sin(B) = \dfrac{1}{2}(\cos(A-B)-\cos(A+B)$ [Provided]

(k) (Product) $\sin(A)\cos(B) = \dfrac{1}{2}(\sin(A-B)+\sin(A+B))$ [Provided]

2. Trig substitution:

   (a) For $\sqrt{1-x^2}$, let $x = \sin\theta$, so $dx = \cos\theta d\theta$.

   (b) For $\sqrt{x^2-1}$, let $x = \sec\theta$, so $dx = \sec\theta\tan\theta d\theta$.

   (c) For $\sqrt{x^2+1}$, let $x = \tan\theta$, so $dx = \sec^2\theta d\theta$.

   (d) Draw a triangle to show the relationships.

3. Examples: 6.2, p. 326: 1-36, 42-60

Next Time

1. Turn in WeBWorK 6.2, Set09-TrigIntegrals: 1, 6