Calculus

Write your questions and thoughts here!

9.2 Trig Integrals

Name:____________________

Notes

Recall: What are the six trig derivatives? Given u is a function.

$\frac{d}{dy}\sin(u) = \cos(u)\cdot u'$ $\qquad$ $\frac{d}{dy}\csc(u) = -\csc(u)\cot(u)\cdot u'$

$\frac{d}{dy}\cos(u) = -\sin(u)\cdot u'$ $\qquad$ $\frac{d}{dy}\sec(u) = \sec(u)\tan(u)\cdot u'$

$\frac{d}{dy}\tan(u) = \sec^2(u)\cdot u'$ $\qquad$ $\frac{d}{dy}\cot(u) = -\csc^2(u)\cdot u'$

Trig Integrals:

$\int \cos x\,dx = \sin x + C$ $\qquad$ $\int -\csc x\cot x\,dx = \csc x + C$

$\int \sin x\,dx = -\cos x + C$ $\qquad$ $\int \sec x\tan x\,dx = \sec x + C$

$\int \sec^2 x\,dx = \tan x + C$ $\qquad$ $\int \csc^2 x\,dx = -\cot x + C$

Preparing for u-substitution: Reverse Chain Rule

only for linear

$\int \cos ax\,dx = \frac{1}{a}\sin(ax) + C$

Find the indefinite integral.

1. $\int -5\sin x\,dx$

$= -5\int \sin x\,dx$

$= -5(-\cos x) + C$

$= 5\cos x + C$

2. $\int \frac{2}{\sec x}dx = 2\int \cos x\,dx$

$= 2\sin x + C$

Evaluate each definite integral.

3. $\int_{\pi/4}^{\pi} -2\cos x\,dx$

$= -2\int_{\pi/4}^{\pi}\cos x\,dx$

$= -2\sin x\Big|_{\pi/4}^{\pi}$

$= -2\left[\sin\pi - \sin\frac{\pi}{4}\right]$

$= -2\left[0 - \frac{\sqrt{2}}{2}\right]$

$= -2\left[-\frac{\sqrt{2}}{2}\right]$

$= \sqrt{2}$

4. $\int_{\pi/4}^{3\pi/4} \sec^2 2x\,dx$

$= \frac{1}{2}\tan(2x)\Big|_{\pi/4}^{3\pi/4}$

$= \frac{1}{2}\left[\tan\left(2\cdot\frac{3\pi}{4}\right) - \tan\left(2\cdot\frac{\pi}{4}\right)\right]$

$= \frac{1}{2}\left[\tan\left(\frac{3\pi}{2}\right) - \tan\left(\frac{\pi}{2}\right)\right]$

$= \frac{1}{2}\left[\text{und} - \text{und}\right]$

= undefined

5. $\int_{-\pi/16}^{0} \sec 4x\tan 4x\,dx$

$= \frac{1}{4}\sec(4x)\Big|_{-\pi/16}^{0}$

$= \frac{1}{4}\left[\sec(4(0)) - \sec\left(4\left(-\frac{\pi}{16}\right)\right)\right]$

$= \frac{1}{4}\left[\sec(0) - \sec\left(\frac{\pi}{4}\right)\right]$

$= \frac{1}{4}\left[1 - \sqrt{2}\right]$

$= \frac{1}{4} - \frac{\sqrt{2}}{4}$

$= \frac{1-\sqrt{2}}{4}$

9.2 Trig Integrals

Notes

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$s = \sqrt{}$
$i =$ inversed
$c =$ |crap|

Recall the inverse trig derivatives. Remember that arcsine(x) is the same as $\sin^{-1} x$.

Inverse Trig Derivatives: Given $\underline{u}$ is a function.

$\frac{d}{dx}\sin^{-1}(u) = \frac{u'}{\sqrt{1-u^2}}$	$\frac{d}{dx}\cos^{-1}(u) = \frac{-u'}{\sqrt{1-u^2}}$
$\frac{d}{dx}\sec^{-1}(u) = \frac{u'}{\lvert u\rvert\sqrt{u^2-1}}$	$\frac{d}{dx}\csc^{-1}(u) = \frac{-u'}{\lvert u\rvert\sqrt{u^2-1}}$
$\frac{d}{dx}\tan^{-1}(u) = \frac{u'}{u^2+1}$	$\frac{d}{dx}\cot^{-1}(u) = \frac{-u'}{u^2+1}$

Taking the integral is just going the other direction!

Find the indefinite integral.

6. $\int -\frac{1}{\sqrt{1-x^2}}dx = \cos^{-1}(x) + C$	7. $\int \frac{3}{9x^2+1}dx = \tan^{-1}(3x) + C$
8. $\int -\frac{1}{\lvert x\rvert\sqrt{4x^2-1}}dx = \csc^{-1}(2x) + C$	9. $\int \frac{20x^3}{\sqrt{1-25x^8}}dx = \sin^{-1}(5x^4) + C$

Now summarize what you learned!