# Calc II Cheat Sheet

by smithandrewa via cheatography.com/71791/cs/18986/

## Trig Integrals

| | |
|---|---|
| $\int \sin x\,dx$ | $= -\cos x\,dx + C$ |
| $\int \cos x\,dx$ | $= \sin x\,dx + C$ |
| $\int \sec^2 x\,dx$ | $= \tan x\,dx + C$ |
| $\int \tan x\,dx$ | $= \ln\lvert\sec x\rvert + C$ |
| $\int \sec x \tan x\,dx$ | $= \sec x + C$ |
| $\int \csc^2 x\,dx$ | $= -\cot x + C$ |
| $\int \csc x \cot x\,dx$ | $= -\csc x + C$ |
| $\int \cot x\,dx$ | $= \ln\lvert\sin x\rvert + C$ |

## Trig Identities

| | |
|---|---|
| $\int (1/x^2 + a^2)\,dx$ | $= 1/a \tan^{-1}(x/a) + C$ |
| $\int (1/\mathrm{Sqrt}(a^2 - x^2))\,dx$ | $= \sin^{-1}(x/a) + C$ |

(While a > 0)

## Area Between Curves

```
Area = ∫[Height] Width
A = ∫(f(x) - g(x)] dx
1. Graph Equasions
2. Label
3. Determine how to slice
4. Set up dA
5. dA = height*dx
6. Get range a & b from inters ections
7. Plug in and find area
```

There is never (-) area.

## Volume by Disk

```
dV = A(x) dx
V = ∫A(x)dx
Volume = ∫Radius^2 * Thickness
V = ∫(pi(r)^2) dx
```

## Volume by Washer

```
dV = A(x) dx
V = ∫A(x) dx
Volume = ∫[(pi r out^2)-(pi r in^2)] dx
```

Slice Perpendicular to Axis of Rotation

## Volume by Shell

```
dVolume = Circumference * dArea
dV = (2 pi r) dArea
V = ∫(2 pi r)(Area)dx
1. Write: dV = 2 pi r dA
2. Find dA(height dx)
3. Find Radius(x or y)
4. Plug in
5. Take integral
```

Slice Parallel to Axis of Rotation

## Average Value of a Function

```
Average Value = 1/b-a * ∫f(x) dx
Symmetry:
If f(x) is EVEN, then ∫f(x)dx from -a to a =
2∫f(x) from 0 to a
If f(x) is ODD, then ∫f(x)dx from -a to a = 0
```

## Important Integrals

| | |
|---|---|
| $\int c\,f(x)\,dx$ | $= c \int f(x)\,dx$ |
| $\int [f(x) + g(x)]\,dx$ | $= \int f(x)\,dx + \int g(x)\,dx$ |
| $\int 1/x\,dx$ | $= \ln\lvert x\rvert + C$ |
| $\int e^x\,dx$ | $= e^x + C$ |
| $\int b^x\,dx$ | $= (b^x / \ln b) + C$ |

## Methods of Integration

| Method | When to Use | Example |
|---|---|---|
| U-Substitution | When a Polynomial is raised to a power > 1 | $\int (3x + 5)^5$ |
| Integration by Parts | When U-Sub will not work | $\int xe^x$ |
| Trigonometric Integr-ation | Only Trig raised to powers | $\int \sin^6 x \cos^3 x dx$ |
| Trigonometric Substi-tution | 3/2 powers or $\mathrm{Sqrt}(a^2-x^2)$ etc. | $dx/(x^2\mathrm{Sqrt}(25-x^2))$ |

## U-Substitution

## Integration by Parts

Logarithmic
Inverse trig
Algebraic
Trigon ometric
Expone ntial

$\int u\,dv = u\,v - \int v\,du$

1. Write $u\,v - \int v\,du$
2. Use LIATE to find u; the other term becomes dV
3. Setup u= dV= du= V=
4. Solve

Cyclical Functions will need to be split and substituted.

## Trigonometric Integration

*Identities*

$\sin^2 t + \cos^2 t = 1$

$\sin^2 t = 1/2\ [1 - \cos(2t)]$

$\cos^2 t = 1/2\ [1 + \cos(2t)]$

Can use with U-Subs tit ution

Don't change all of the trig to the same form.

## Trigonometric Integration

*Identities*

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## Trigonometric Substitution

*Pythag. Identities*

$\sin^2 + \cos^2 = 1$

$1 + \tan^2 = \sec^2$

$1 + \cot^2 = \csc^2$

1. Identify a and u
2. Sub in the trig
3. Manipulate to simplify
4. Get rid of trig with a triangle