In [58]:

```
import pandas as pd



def styled_formula_table(df):
    """Return styled display table for formulas"""

    mytable = df.style.set_properties(subset=['Formula', 'Key'], **{'width':
        {'selector': 'th.col_heading', 'props': 'text-align: left'},
        {'selector': 'td', 'props': 'text-align: left'}])

    return (mytable)




if __name__ == '__main__':

    # Latex string in csv needs to be enclosed a single $ to enable left ali
    df=  pd.read_csv(filepath_or_buffer='formulas.csv')
    display(styled_formula_table(df))
```

	Category	Sub-category	Description	Key	Formula	Year	On formula sheet
0	Indices	Index Rules	Multiplying terms with same base	nan	$a^m \times a^n = a^{m+n}$	9	False
1	Indices	Index Rules	Dividing terms with same base	nan	$a^m \div a^n = \frac{a^m}{a^n} = a^{m-n}$	9	False
2	Indices	Index Rules	Power of a power	nan	$(a^m)^n = a^{m \times n}$	9	False
3	Indices	Index Rules	Powers of products	nan	$(ab)^n = a^n b^n$	9	False
4	Indices	Index Rules	Powers of quotients	nan	$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$	9	False
5	Indices	Index Rules	Power of zero	nan	$a^0 = 1$	9	False
6	Indices	Index Rules	Negative powers	nan	$a^{-n} = \frac{1}{a^n}$	9	False
7	Indices	Index Rules	Negative powers of quotients	nan	$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$	9	False
8	Indices	Index Rules	Fractional powers	nan	$a^{\frac{m}{n}} = \sqrt[n]{a^m}$	9	False
9	Differentiation	nan	nan	$y = f(x)^n$	$\frac{dy}{dx} = nf'(x)[f(x)]^{n-1}$	12	True
10	Integration	nan	nan	$y = f(x)^n$	$\int f'(x)[f(x)]^n dx = \frac{1}{n+1}[f(x)]^{n+1} + c \text{ where } n \neq 1$	12	True
11	Differentiation	nan	nan	$y = sinf(x)$	$\frac{dy}{dx} = f'(x)cosf(x)$	12	True

	Category	Sub-category	Description	Key	Formula	Year	On formula sheet
12	Integration	nan	nan	$y = sinf(x)$	$\int f'(x)cosf(x)dx = sinf(x) + c$	12	True
13	Differentiation	nan	nan	$y = cosf(x)$	$\frac{dy}{dx} = -f'(x)sinf(x)$	12	True
14	Integration	nan	nan	$y = cosf(x)$	$\int f'(x)sinf(x)dx = -cosf(x) + c$	12	True
15	Differentiation	nan	nan	$y = tanf(x)$	$\frac{dy}{dx} = f'(x)sec^2f(x)$	12	True
16	Integration	nan	nan	$y = tanf(x)$	$\int f'(x)sec^2f(x)dx = tanf(x) + c$	12	True
17	Differentiation	nan	nan	$y = e^{f(x)}$	$\frac{dy}{dx} = f'(x)e^{f(x)}$	12	True
18	Integration	nan	nan	$y = e^{f(x)}$	$\int f'(x)e^{f(x)}dx = e^{f(x)} + c$	12	True
19	Differentiation	nan	nan	$y = lnf(x)$	$\frac{dy}{dx} = \frac{f'(x)}{f(x)}$	12	True
20	Integration	nan	nan	$y = lnf(x)$	$\int \frac{f'(x)}{f(x)}dx = ln\|f(x)\| + c$	12	True
21	Differentiation	nan	nan	$y = a^{f(x)}$	$\frac{dy}{dx} = (ln a)f'(x)a^{f(x)}$	12	True

	Category	Sub-category	Description	Key	Formula	Year	On formula sheet
22	Integration	nan	nan	$y = a^{f(x)}$	$\int f'(x)a^{f(x)}dx = \frac{a^f(x)}{ln\,a} + c$	12	True
23	Differentiation	nan	nan	$y = log_a f(x)$	$\frac{dy}{dx} = \frac{f'(x)}{(ln\,a)f(x)}$	12	True
24	Differentiation	nan	nan	$y = uv$	$\frac{dy}{dx} = u\frac{dv}{dx} + v\frac{du}{dx}$	12	True
25	Integration	nan	nan	$y = uv$	$\int u\frac{dv}{dx}dx = uv - \int v\frac{du}{dx}dx$	12	nan

	Category	Sub-category	Description	Key	Formula	Year	On formula sheet
26	Differentiation	nan	nan	$y = \frac{u}{v}$	$\frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$	12	True
27	Differentiation	nan	nan	$y = g(u)$ where $u = f(x)$	$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$	12	True
28	Differentiation	nan	nan	$y = sin^{-1}f(x)$	$\frac{dy}{dx} = \frac{f'(x)}{\sqrt{1-(f(x))^2}}$	12	True
29	Integration	nan	nan	$y = sin^{-1}f(x)$	$\int \frac{f'(x)}{\sqrt{a^2-(f(x))^2}}dx = sin^{-1}\frac{f(x)}{a} + c$	12	True
30	Differentiation	nan	nan	$y = cos^{-1}f(x)$	$\frac{dy}{dx} = -\frac{f'(x)}{\sqrt{1-(f(x))^2}}$	12	True
31	Differentiation	nan	nan	$y = tan^{-1}f(x)$	$\frac{dy}{dx} = -\frac{f'(x)}{1+(f(x))^2}$	12	No square root as pe inverse si and inverse cos derivative and plus sign
32	Integration	nan	nan	$y = tan^{-1}f(x)$	$\int \frac{f'(x)}{a^2+(f(x))^2}dx = \frac{1}{a}tan^{-1}\frac{f(x)}{a} + c$	12	True

	Category	Sub-category	Description	Key	Formula	Year	On formula sheet
33	Integration	nan	nan	*approx*	" $\int_a^b f(x)dx \approx \frac{b-a}{2n} \{f(a)+f(b) + 2\lbrack f(x_1)+..+f(x_{n-1})\rbrack \}$ where $a = x_0$ and $b = x_n$ "	12	True

In [45]:
```
# Differentiation
from IPython.display import Latex
test = r"$ \dfrac{dx}{dy} = -f'(x)sin f(x)$"

# test = '$log _{a} f(x)$'

display (Latex(test))
```

$log_a f(x)$

In [6]:
```
# Integrals
test = r"$ {\Large\int} f'(x)sin f(x)dx = -cos f(x) + c$"
display (Latex(test))
```

$\int f'(x)sinf(x)dx = -cosf(x) + c$

In [59]:
```
#To do : Concatenate the 2 comment fields  (if 2 comments exist need to add
# Change the width of the Function to differeentiate column
# Can I get a newline before ...when n does not equal -1

df_calculus = df[['Category', 'Key', 'Formula', 'Comment']][df["Category"].i

df_calculus = df_calculus.pivot(columns='Category', index = 'Key').fillna('

df_calculus.columns = df_calculus.columns.get_level_values(0) +' ' + df_calc

df_calculus['Comment'] = df_calculus['Comment Differentiation'] + df_calculu

df_calculus = df_calculus.reset_index()
df_calculus =  df_calculus.drop(labels = ['Comment Differentiation', 'Commer
df_calculus = df_calculus.rename(columns={
    "Key": "Function to differentiate",
    "Formula Differentiation": "Derivative",
    "Formula Integration":"Equivalent integral"})
```

```
mytable = df_calculus.style.set_properties(subset=['Function to differentiat
    {'selector': 'th.col_heading', 'props': 'text-align: left'},
    {'selector': 'td', 'props': 'text-align: left'}])


display(mytable)

# display(df_calculus)

# df_calculus[('Comment', 'Differentiation')]
```

	Function to differentiate	Derivative	Equivalent integral	Comme
0	$approx$		" $\int_a^b f(x)dx \approx \frac{b-a}{2n}\{f(a) + f(b) + 2[f(x_1)+\ldots +f(x_{n-1})]\}$ where $a = x_0$ and $b = x_n$ "	
1	$y = \frac{u}{v}$	$\frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$		
2	$y = a^{f(x)}$	$\frac{dy}{dx} = (ln\, a)f'(x)a^{f(x)}$	$\int f'(x)a^{f(x)}dx = \frac{a^f(x)}{ln\, a} + c$	In a is a constan therefor be remo from the integral go on th other sid the inter equation when compar the deriv equation
3	$y = cos^{-1}f(x)$	$\frac{dy}{dx} = -\frac{f'(x)}{\sqrt{1-(f(x))^2}}$		Note the minus in of fracti Why no integral equivale
4	$y = cosf(x)$	$\frac{dy}{dx} = -f'(x)sinf(x)$	$\int f'(x)sinf(x)dx = -cosf(x) + c$	
5	$y = e^{f(x)}$	$\frac{dy}{dx} = f'(x)e^{f(x)}$	$\int f'(x)e^{f(x)}dx = e^{f(x)} + c$	
6	$y = f(x)^n$	$\frac{dy}{dx} = nf'(x)[f(x)]^{n-1}$	$\int f'(x)[f(x)]^n dx = \frac{1}{n+1}[f(x)]^{n+1} + c$ where $n \neq 1$	What happens when n
7	$y = g(u)$ where $u = f(x)$	$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$		
8	$y = lnf(x)$	$\frac{dy}{dx} = \frac{f'(x)}{f(x)}$	$\int \frac{f'(x)}{f(x)}dx = ln\lvert f(x)\rvert + c$	Why abs value?

	Function to differentiate	Derivative	Equivalent integral	Comme
9	$y = log_a f(x)$	$\frac{dy}{dx} = \frac{f'(x)}{(ln\, a) f(x)}$		This for is not re needed formula as origi function easily b rewritte $\frac{ln\, f(x)}{ln\, a}$ where $\frac{1}{l}$ is a con therefor derivati rules for $y = \text{cons} \times ln\, f($ can be followe equivale integral provide formula but can easily derived.
10	$y = sin^{-1} f(x)$	$\frac{dy}{dx} = \frac{f'(x)}{\sqrt{1-(f(x))^2}}$	$\int \frac{f'(x)}{\sqrt{a^2-(f(x))^2}} dx = sin^{-1} \frac{f(x)}{a} + c$	
11	$y = sinf(x)$	$\frac{dy}{dx} = f'(x) cosf(x)$	$\int f'(x) cosf(x) dx = sinf(x) + c$	
12	$y = tanf(x)$	$\frac{dy}{dx} = f'(x) sec^2 f(x)$	$\int f'(x) sec^2 f(x) dx = tanf(x) + c$	
13	$y = tan^{-1} f(x)$	$\frac{dy}{dx} = -\frac{f'(x)}{1+(f(x))^2}$	$\int \frac{f'(x)}{a^2+(f(x))^2} dx = \frac{1}{a} tan^{-1} \frac{f(x)}{a} + c$	No squa root as inverse and inv cos derivati and plus
14	$y = uv$	$\frac{dy}{dx} = u\frac{dv}{dx} + v\frac{du}{dx}$	$\int u\frac{dv}{dx} dx = uv - \int v\frac{du}{dx} dx$	