Integration by computer with Mathematica.

□ Calculus 153/22 M. Pergler April 1999

(this does the same math as the Maple handout, just using a different program so you see the difference in input syntax. Main differences: (a) Function names are capitalized (b) arguments have square brackets (c) You don't have to do the layout (brackets and shading)...*Mathematica* did that.)

```
f[x_] := (2 x^4 - 8 x^3 - 20 x^2 + 216 x - 286) /
   (x^5 - 11 x^4 + 58 x^3 - 134 x^2 + 21 x + 225)
```

```
Integrate[f[x], x]
```

$$-\frac{2}{-3+x}-\frac{1}{2}\text{ArcTan}\left[\frac{4}{-3+x}\right]+\text{Log}[-3+x]-\text{Log}[1+x]+\text{Log}[25-6x+x^2]$$

```
Apart[f[x]]
```

$$\frac{2}{(-3+x)^2}+\frac{1}{-3+x}-\frac{1}{1+x}+\frac{2(-2+x)}{25-6x+x^2}$$

```
g[x_] := (Sin[x] + Tan[Sqrt[x]]) (1 + Exp[1 / x])
```

```
Integrate[g[x], {x, 1, 2}]
```

$$\int_1^2 \left(1+E^{\frac{1}{x}}\right)\left(\text{Sin}[x]+\text{Tan}\left[\sqrt{x}\right]\right)\,dx$$

```
N[%, 50]
```

```
11.96846920512586
```

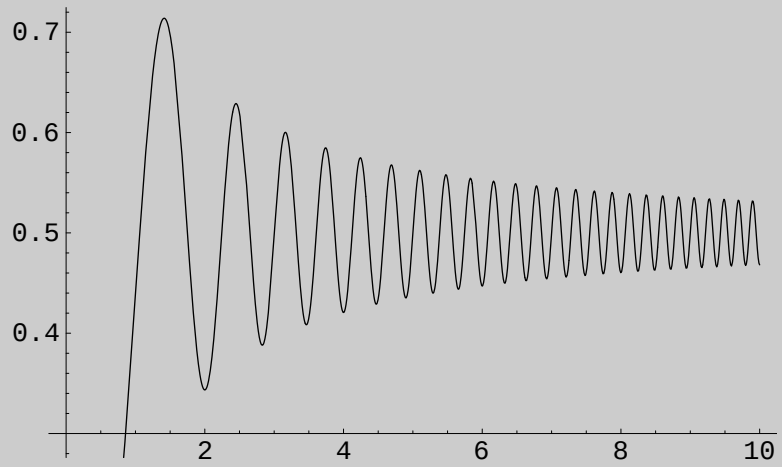
```
Integrate[Sin[x^2], x]
```

$$\sqrt{\frac{\pi}{2}}\,\text{FresnelS}\left[\sqrt{\frac{2}{\pi}}\,x\right]$$

Looking up FresnelS in the help browser....

- FresnelS[z] is given by $\int_0^z \sin(\pi t^2/2)\,dt$.
- FresnelS[z] is an entire function of z with no branch cut discontinuities.

```
Plot[FresnelS[x], {x, 0, 10}]
```




```
<< Graphics‘Polyhedra‘
```

```
Show[Truncate[
 Polyhedron[Dodecahedron], .4]]
```