Numerical integration demo July 13, 2007.

```
> f:=t->t^3+t;
```

$$f := t \to t^3 + t$$

```
> A:=int(f(x),x=0..1);
```

$$A := \frac{3}{4}$$

```
> with(student);
```

[D, *Diff*, *Doubleint*, *Int*, *Limit*, *Lineint*, *Product*, *Sum*, *Tripleint*, *changevar*, *completesquare*, *distance*, *equate*, *integrand*, *intercept*, *intparts*, *leftbox*, *leftsum*, *makeproc*, *middlebox*, *middlesum*, *midpoint*, *powsubs*, *rightbox*, *rightsum*, *showtangent*, *simpson*, *slope*, *summand*, *trapezoid*]

```
> A1:=trapezoid(f(x),x=0..1,4);
```

$$A1 := \frac{1}{4} + \frac{1}{4}\left(\sum_{i=1}^{3}\left(\frac{1}{64}i^3 + \frac{1}{4}i\right)\right)$$

```
> evalf(%);
```

$$0.7656250000$$

```
> E1:=abs(A1-A);
```

$$E1 := \left|-\frac{1}{2} + \frac{1}{4}\left(\sum_{i=1}^{3}\left(\frac{1}{64}i^3 + \frac{1}{4}i\right)\right)\right|$$

```
> evalf(%);
```

$$0.0156250000$$

```
> A2:=evalf(trapezoid(f(x),x=0..1,8));
```

$$A2 := 0.7539062500$$

```
> E2:=evalf(abs(A2-A));
```

$$E2 := 0.0039062500$$

```
> E2*4;
```

$$0.0156250000$$

Note that when n is increased by a factor of 2, error decreases by factor of 4.