```
> restart;
> h := x→a − x;
```

$$h := x \to a - x \tag{1}$$

```
> g := x→f(h(x));
```

$$g := x \to f(h(x)) \tag{2}$$

```
> with(IntegrationTools);
```

$$[Change, CollapseNested, Combine, Expand, ExpandMultiple, Flip, GetIntegrand, GetOptions, GetParts, GetRange, GetVariable, Parts, Split, StripOptions] \tag{3}$$

```
>
>
> V := ∫_0^a (d/dx) g(x) dx;
```

$$V := \int_0^a (-\mathrm{D}(f)\,(a-x))\,dx \tag{4}$$

```
> LS := Parts(V, 1);
```

$$LS := f(0) - f(a) \tag{5}$$

```
>
> V1 := Parts( V, (d/dx) g(x) );
```

$$V1 := -a\,\mathrm{D}(f)\,(0) - \left(\int_0^a x\,\mathrm{D}^{(2)}(f)\,(a-x)\,dx \right) \tag{6}$$

```
>
> V2 := Parts(V1, diff(g(x), x$2));
```

$$V2 := -a\,\mathrm{D}(f)\,(0) - \frac{1}{2}\,a^2\,\mathrm{D}^{(2)}(f)\,(0) + \int_0^a \left(-\frac{1}{2}\,x^2\,\mathrm{D}^{(3)}(f)\,(a-x) \right) dx \tag{7}$$

```
> V3 := Parts(V2, diff(g(x), x$3));
```

$$V3 := -a\,\mathrm{D}(f)\,(0) - \frac{1}{2}\,a^2\,\mathrm{D}^{(2)}(f)\,(0) - \frac{1}{6}\,a^3\,\mathrm{D}^{(3)}(f)\,(0) - \left(\int_0^a \frac{1}{6}\,x^3\,\mathrm{D}^{(4)}(f)\,(a-x)\,dx \right) \tag{8}$$

```
> V4 := Parts(V3, diff(g(x), x$4));
```

$$V4 := -a\,\mathrm{D}(f)\,(0) - \frac{1}{2}\,a^2\,\mathrm{D}^{(2)}(f)\,(0) - \frac{1}{6}\,a^3\,\mathrm{D}^{(3)}(f)\,(0) - \frac{1}{24}\,a^4\,\mathrm{D}^{(4)}(f)\,(0) + \int_0^a \left(-\frac{1}{24}\,x^4\,\mathrm{D}^{(5)}(f)\,(a-x) \right) dx \tag{9}$$

```
> V5 := Parts(V4, diff(g(x), x$5));
```

$$V5 := -a\,\mathrm{D}(f)(0) - \frac{1}{2}a^2\,\mathrm{D}^{(2)}(f)(0) - \frac{1}{6}a^3\,\mathrm{D}^{(3)}(f)(0) - \frac{1}{24}a^4\,\mathrm{D}^{(4)}(f)(0) - \frac{1}{120}a^5\,\mathrm{D}^{(5)}(f)(0) - \left(\int_0^a \frac{1}{120}x^5\,\mathrm{D}^{(6)}(f)(a-x)\,dx\right) \quad (10)$$

> *simplify*((**10**));

$$-a\,\mathrm{D}(f)(0) - \frac{1}{2}a^2\,\mathrm{D}^{(2)}(f)(0) - \frac{1}{6}a^3\,\mathrm{D}^{(3)}(f)(0) - \frac{1}{24}a^4\,\mathrm{D}^{(4)}(f)(0) - \frac{1}{120}a^5\,\mathrm{D}^{(5)}(f)(0) - \frac{1}{120}\int_0^a x^5\,\mathrm{D}^{(6)}(f)(a-x)\,dx \quad (11)$$

>

> *LS* = (**11**);

$$f(0) - f(a) = -a\,\mathrm{D}(f)(0) - \frac{1}{2}a^2\,\mathrm{D}^{(2)}(f)(0) - \frac{1}{6}a^3\,\mathrm{D}^{(3)}(f)(0) - \frac{1}{24}a^4\,\mathrm{D}^{(4)}(f)(0) - \frac{1}{120}a^5\,\mathrm{D}^{(5)}(f)(0) - \frac{1}{120}\int_0^a x^5\,\mathrm{D}^{(6)}(f)(a-x)\,dx \quad (12)$$

> *solve*((**12**), *f*(*a*)); # *note below is f(a) we have just moved equation around*

$$a\,\mathrm{D}(f)(0) + \frac{1}{2}a^2\,\mathrm{D}^{(2)}(f)(0) + \frac{1}{6}a^3\,\mathrm{D}^{(3)}(f)(0) + \frac{1}{24}a^4\,\mathrm{D}^{(4)}(f)(0) + \frac{1}{120}a^5\,\mathrm{D}^{(5)}(f)(0) + \frac{1}{120}\int_0^a x^5\,\mathrm{D}^{(6)}(f)(a-x)\,dx + f(0) \quad (13)$$

>

> *#f* := *cos*(*x*);

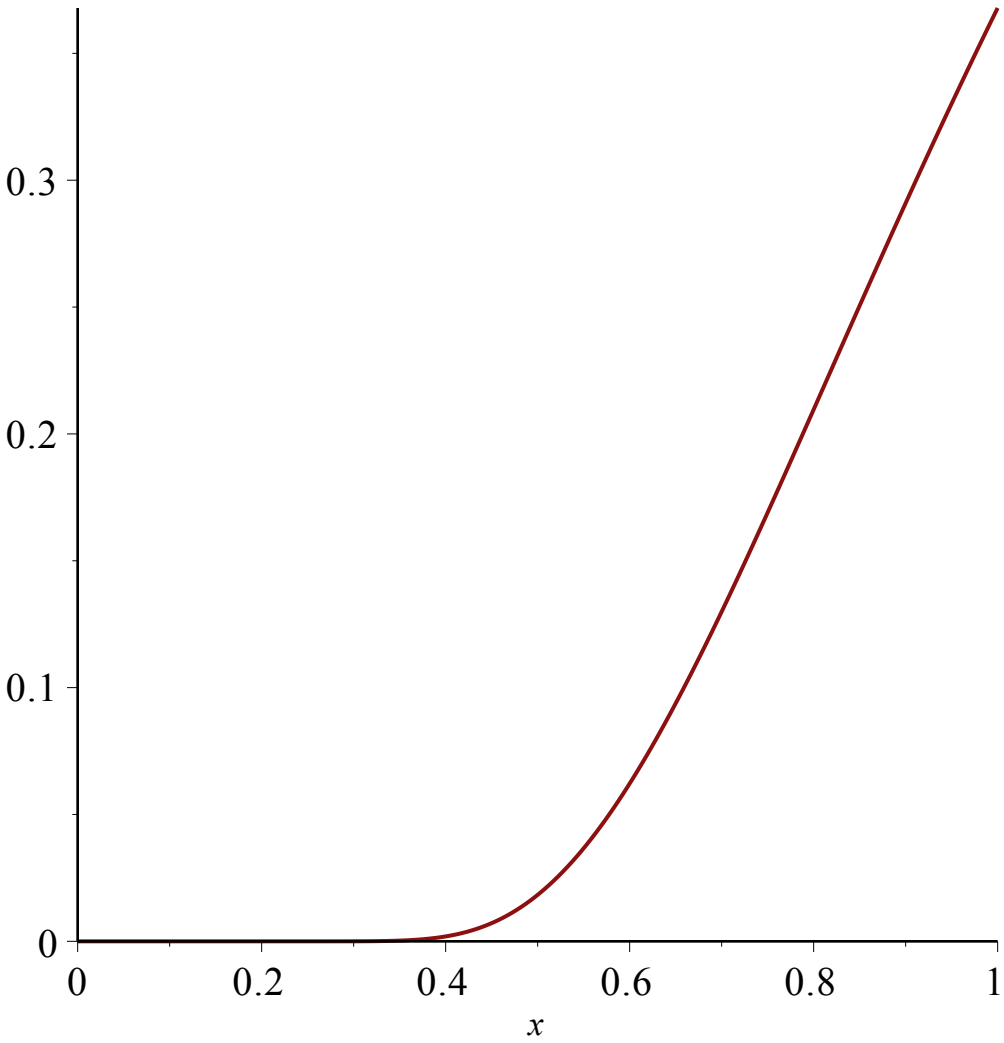
> $f := x \to \begin{cases} 0 & x \le 0 \\ \exp\left(-\frac{1}{x^2}\right) & x > 0 \end{cases}$;

$$f := x \to piecewise\left(x \le 0, 0, 0 < x, e^{-\frac{1}{x^2}}\right) \quad (14)$$

> $truncated := a\,\mathrm{D}(f)(0) + \frac{1}{2}a^2\,\mathrm{D}^{(2)}(f)(0) + \frac{1}{6}a^3\,\mathrm{D}^{(3)}(f)(0) + \frac{1}{24}a^4\,\mathrm{D}^{(4)}(f)(0) + \frac{1}{120}a^5\,\mathrm{D}^{(5)}(f)(0)$;

$$truncated := 0 \quad (15)$$

> *plot*(*f*(*x*), *x* = 0 .. 1);


0.3
0.2
0.1
0
0
0.2
0.4
0.6
0.8
1
x

>

>