

TOL := 0.0000001

a := 0.01, 0.02 .. 5

$$\text{psitrue}(xi) := \frac{1}{\frac{1}{\pi^{\frac{1}{4}}}} \exp(-0.5 \cdot xi^2)$$

$$\int_{-\infty}^{\infty} \text{psitrue}(xi)^2 dx = 1.000000$$

$$T_{\text{true}} := \int_{-\infty}^{\infty} 0.5 \cdot (-xi \cdot \text{psitrue}(xi))^2 dx$$

$$V_{\text{true}} := \int_{-\infty}^{\infty} \text{psitrue}(xi) \cdot (0.5 \cdot xi^2) \cdot \text{psitrue}(xi) dx$$

Ttrue = 0.250000

Vtrue = 0.250000

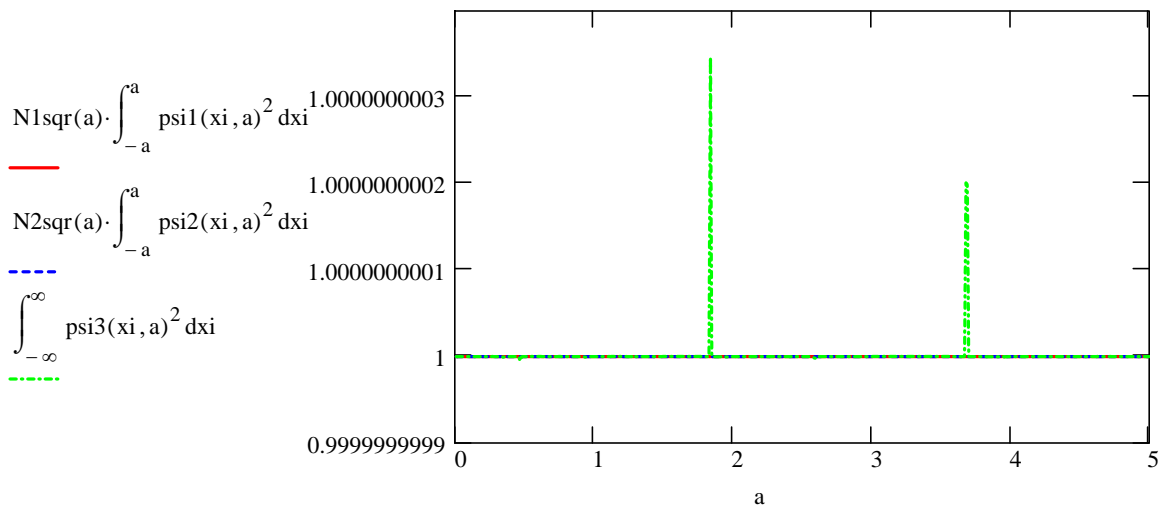
$$\text{psi1}(xi, a) := \text{if}(|xi| < a, a - |xi|, 0)$$

$$N1\text{sqr}(a) := \frac{3}{2a^3}$$

$$\text{psi2}(xi, a) := \text{if}(|xi| < a, a^2 - xi^2, 0)$$

$$N2\text{sqr}(a) := \frac{15}{16a^5}$$

$$\text{psi3}(xi, a) := \frac{1}{\sqrt{a}} \exp\left(\frac{-|xi|}{a}\right)$$



$$T1(a) := N1\text{sqr}(a) \cdot \int_{-a}^a 0.5 dx$$

$$V1(a) := N1\text{sqr}(a) \cdot \int_{-a}^a \text{psi1}(xi, a) \cdot (0.5 \cdot xi^2) \cdot \text{psi1}(xi, a) dx$$

$$T2(a) := N2\text{sqr}(a) \cdot \int_{-a}^a 0.5 \cdot (-2 \cdot xi)^2 dx$$

$$V2(a) := N2\text{sqr}(a) \cdot \int_{-a}^a \text{psi2}(xi, a) \cdot (0.5 \cdot xi^2) \cdot \text{psi2}(xi, a) dx$$

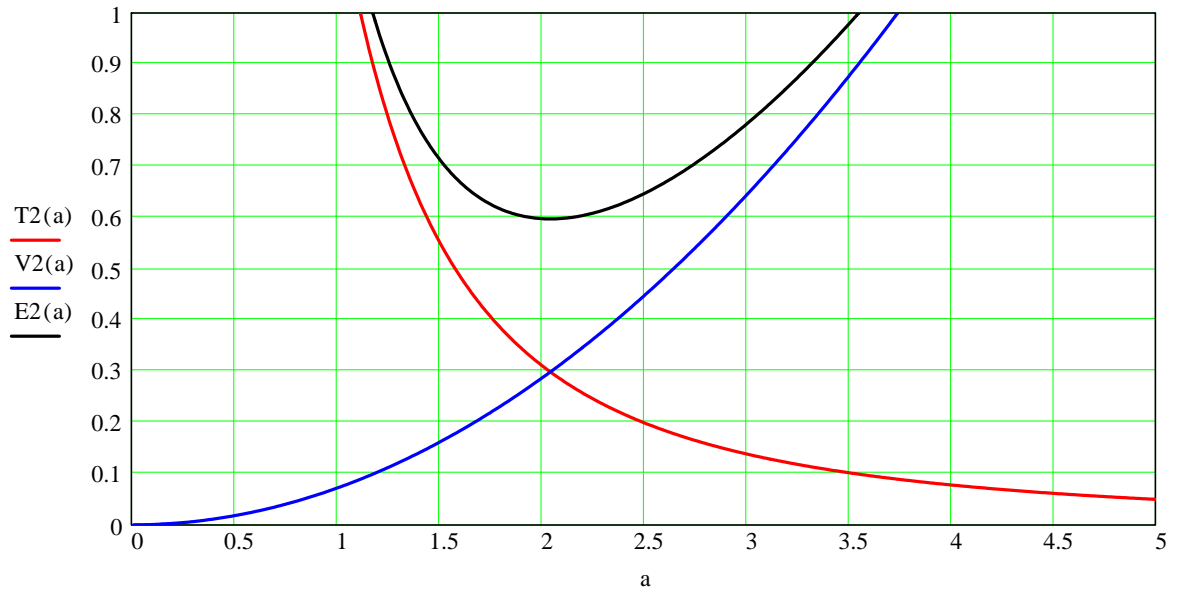
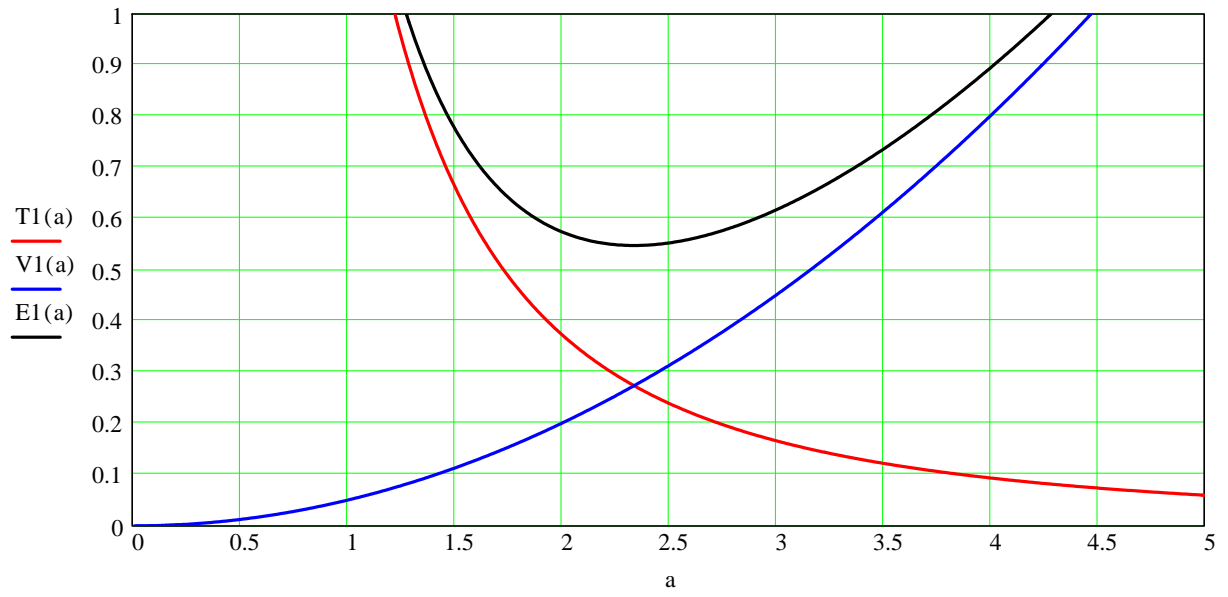
$$E1(a) := T1(a) + V1(a)$$

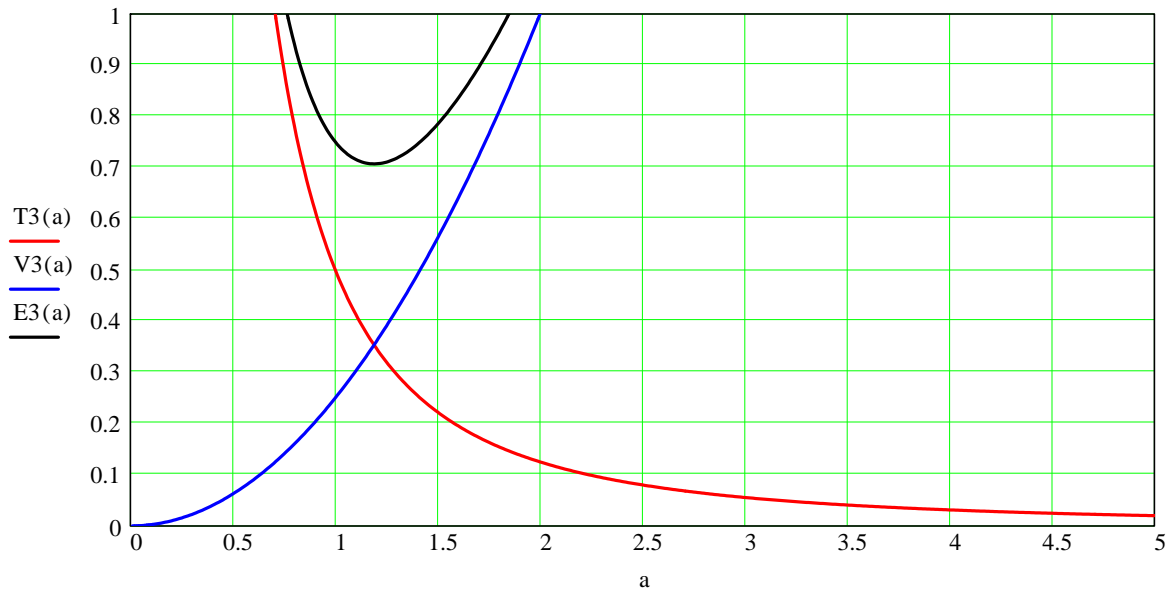
$$E2(a) := T2(a) + V2(a)$$

$$T3(a) := \int_{-\infty}^{\infty} 0.5 \cdot \left(\frac{\text{psi3}(xi, a)}{a}\right)^2 dx$$

$$V3(a) := \int_{-\infty}^{\infty} \text{psi3}(xi, a) \cdot (0.5 \cdot xi^2) \cdot \text{psi3}(xi, a) dx$$

$$E3(a) := T3(a) + V3(a)$$



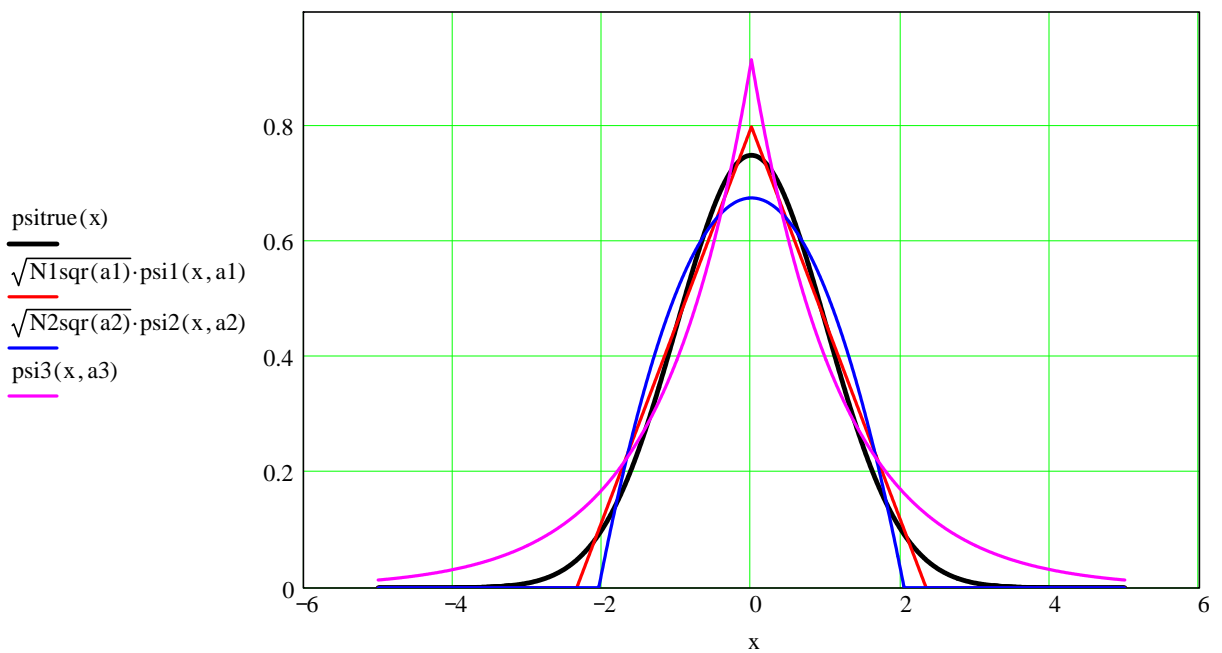


$x := -5, -4.99 \dots 5$

$a1 := 2.3405$

$a2 := 2.0452$

$a3 := 1.1892$

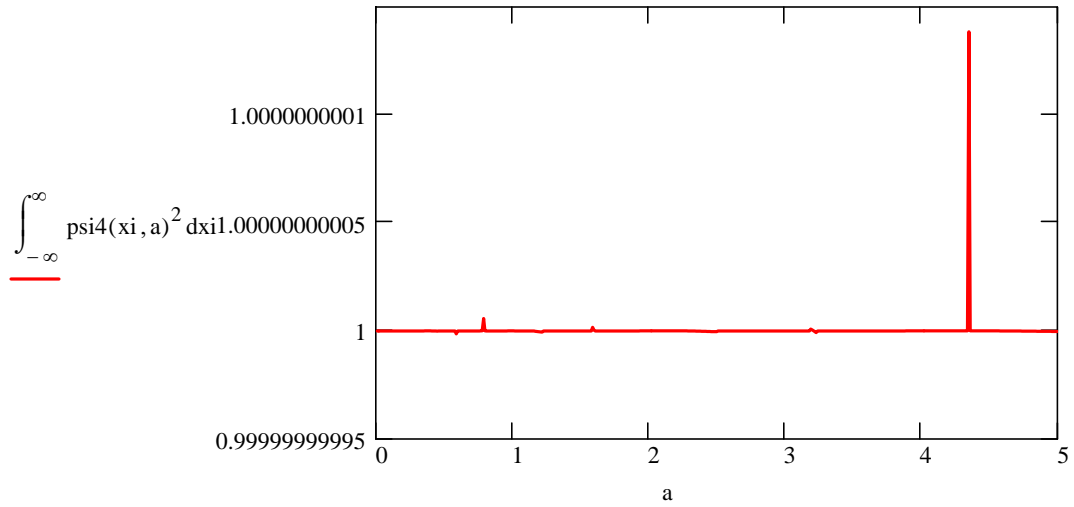


$E1(a1) = 0.54772$

$E2(a2) = 0.59761$

$E3(a3) = 0.70711$

$$\psi4(x_i, a) := \sqrt{\frac{2}{a^3}} \cdot x_i \cdot \exp\left(\frac{-|x_i|}{a}\right)$$

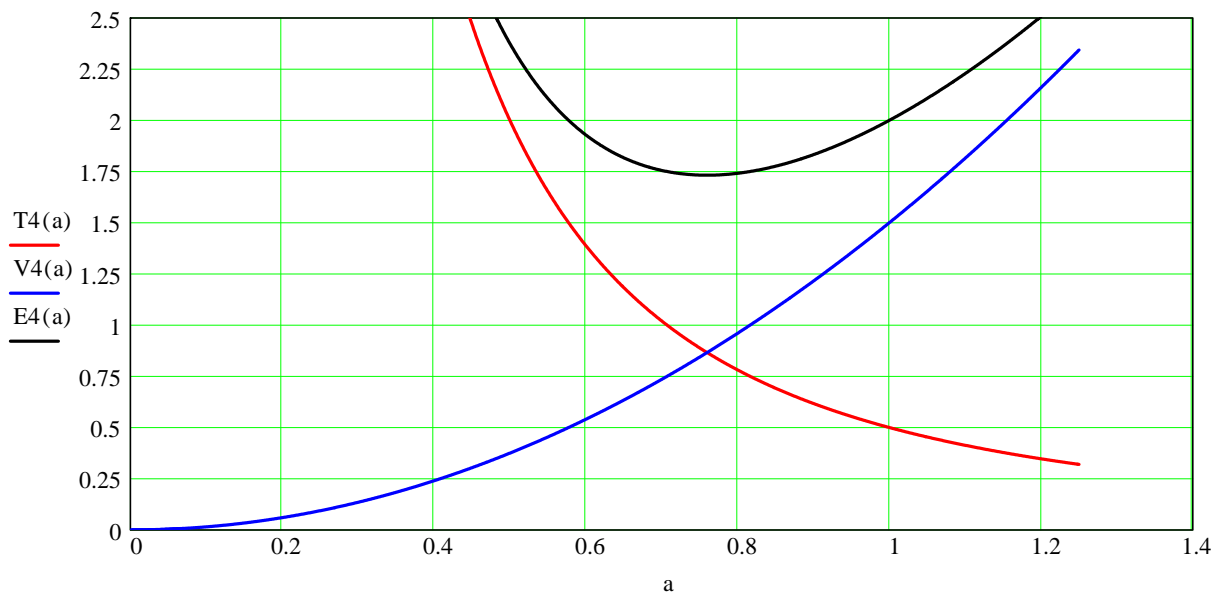


$$T4(a) := \int_{-\infty}^{\infty} 0.5 \cdot \left[ \sqrt{\frac{2}{a^3}} \cdot \left( 1 - \frac{|\text{xi}|}{a} \right) \cdot \exp\left(\frac{-|\text{xi}|}{a}\right) \right]^2 dx$$

$$V4(a) := \int_{-\infty}^{\infty} \text{psi4}(\text{xi}, a) \cdot (0.5 \cdot \text{xi}^2) \cdot \text{psi4}(\text{xi}, a) dx$$

$$E4(a) := T4(a) + V4(a)$$

$a := 0.001, 0.002 \dots 1.25$



$$a4 := 0.7598$$

$$E4(a4) = 1.732$$

$$\text{psi4t}(xi) := \sqrt{\frac{2}{\sqrt{\pi}}} xi \cdot \exp(-0.5 \cdot xi^2)$$

