**4.** $g_{\text{ave}} = \frac{1}{2-0}\int_0^2 x^2\sqrt{1+x^3}\,dx = \frac{1}{2}\int_1^9 \sqrt{u}\cdot\frac{1}{3}\,du \quad [u = 1+x^3,\ du = 3x^2\,dx] \quad = \frac{1}{6}\left[\frac{2}{3}u^{3/2}\right]_1^9 = \frac{1}{9}(27-1) = \frac{26}{9}$

**5.** $f_{\text{ave}} = \frac{1}{5-0}\int_0^5 te^{-t^2}\,dt = \frac{1}{5}\int_0^{-25} e^u\left(-\frac{1}{2}\,du\right) \qquad \left[u = -t^2,\ du = -2t\,dt,\ t\,dt = -\frac{1}{2}\,du\right]$

$= -\frac{1}{10}\left[e^u\right]_0^{-25} = -\frac{1}{10}(e^{-25}-1) = \frac{1}{10}(1-e^{-25})$

**7.** $h_{\text{ave}} = \frac{1}{\pi-0}\int_0^\pi \cos^4 x\,\sin x\,dx = \frac{1}{\pi}\int_1^{-1} u^4(-du) \quad [u = \cos x,\ du = -\sin x\,dx]$

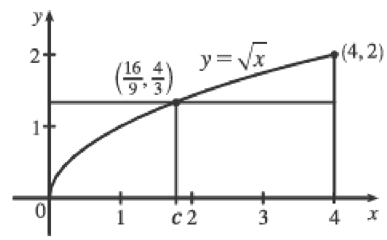
$= \frac{1}{\pi}\int_{-1}^1 u^4\,du = \frac{1}{\pi}\cdot 2\int_0^1 u^4\,du \quad \text{[by Theorem 5.5.7]} \quad = \frac{2}{\pi}\left[\frac{1}{5}u^5\right]_0^1 = \frac{2}{5\pi}$

**10.** (a) $f_{\text{ave}} = \dfrac{1}{4-0}\displaystyle\int_0^4 \sqrt{x}\,dx = \frac{1}{4}\left[\frac{2}{3}x^{3/2}\right]_0^4$

$= \frac{1}{6}\left[x^{3/2}\right]_0^4 = \frac{1}{6}[8-0] = \frac{4}{3}$

(b) $f(c) = f_{\text{ave}} \quad \Leftrightarrow \quad \sqrt{c} = \frac{4}{3} \quad \Leftrightarrow \quad c = \frac{16}{9}$

(c)




**19.** $\rho_{\text{ave}} = \dfrac{1}{8}\displaystyle\int_0^8 \frac{12}{\sqrt{x+1}}\,dx = \frac{3}{2}\int_0^8 (x+1)^{-1/2}\,dx = \left[3\sqrt{x+1}\right]_0^8 = 9-3 = 6\ \text{kg/m}$