Problem 2a

$$\int_{-2e}^{-1} \frac{1}{x}\,dx \rightarrow -\ln(2) - 1 = -1.693$$

Problem 2b

$$\int_{-e^2}^{-2} \frac{1}{x}\,dx \rightarrow \ln(2) - 2 = -1.307$$

remember that

$$\frac{d}{dx}\ln(|x|) = \frac{1}{x}$$

Problem 3a

$$a(t) := 5t + 4 \qquad v(t) := \int_0^t a(\tau)\,d\tau + 3 \rightarrow \frac{t\cdot(5\cdot t + 8)}{2} + 3 \qquad \frac{5\cdot t^2}{2} + 4\cdot t + 3$$

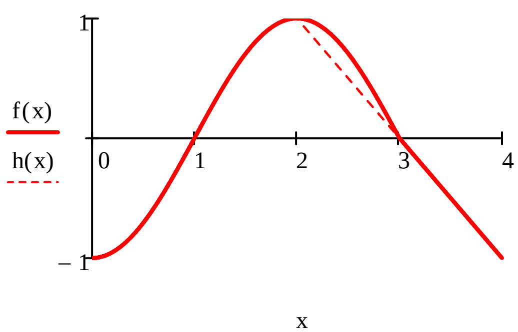
$$s(t) := \int_0^t v(\tau)\,d\tau + 0 \rightarrow \frac{t\cdot\left(5\cdot t^2 + 12\cdot t + 18\right)}{6} \qquad \frac{5\cdot t^3}{6} + 2\cdot t^2 + 3\cdot t \qquad s(5) \rightarrow \frac{1015}{6}$$

Problem 3b

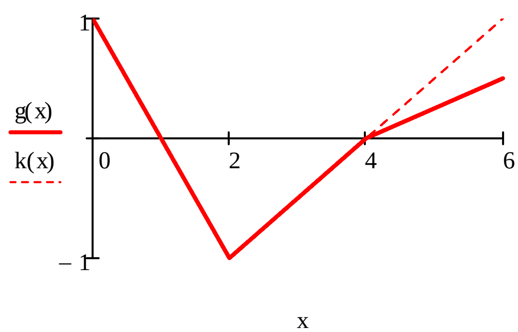
$$a(t) := 3t + 4 \qquad v(t) := \int_0^t a(\tau)\,d\tau + 5 \rightarrow \frac{t\cdot(3\cdot t + 8)}{2} + 5 \qquad \frac{3\cdot t^2}{2} + 4\cdot t + 5$$

$$s(t) := \int_0^t v(\tau)\,d\tau + 0 \rightarrow \frac{t\cdot\left(t^2 + 4\cdot t + 10\right)}{2} \qquad \frac{t^3}{2} + 2\cdot t^2 + 5\cdot t \qquad s(5) \rightarrow \frac{275}{2}$$

Problem 4a



Problem 4b



Dotted lines are for the comparison of the areas above and below the x-axis.

Problem 6a

$2\pi = r^2 h\cdot\pi$ $h(r) := 2\cdot r^{-2}$ $surf(r) := 2r\cdot h(r)\cdot\pi + 2r^2\cdot\pi \rightarrow \frac{4\cdot\pi}{r} + 2\cdot\pi\cdot r^2$

$\frac{d}{dr}surf(r) \rightarrow 4\cdot\pi\cdot r - \frac{4\cdot\pi}{r^2}$ $\frac{d}{dr}surf(r) = 0$ iff $r = 1$ $h = 2$

Problem 6b

$\pi = r^2 h\cdot\pi$ $h(r) := r^{-2}$ $surf(r) := 2r\cdot h(r)\cdot\pi + 2r^2\cdot\pi \rightarrow \frac{2\cdot\pi}{r} + 2\cdot\pi\cdot r^2$

$\frac{d}{dr}surf(r) \rightarrow 4\cdot\pi\cdot r - \frac{2\cdot\pi}{r^2}$ $\frac{d}{dr}surf(r) = 0$ iff $r = \frac{1}{\sqrt[3]{2}}$ $\frac{1}{\sqrt[3]{2}} = 0.794$

$h = \sqrt[3]{4}$ $\sqrt[3]{4} = 1.587$