Aufgabe 2:

$$t = \int_{v(t_0)}^{v(t)} \frac{m}{R(v)}\,dv$$

$$\Rightarrow \int_{20}^{5} \frac{10}{-v\sqrt{v}}\,dv = \int_{20}^{5} -10 \cdot v^{-3/2}\,dv$$

$$= \left[20 \cdot v^{-1/2}\right]_{20}^{5} = 4.472136$$

$m = 10$

$v(0) = 20\ m/s$

$R(v) = -v \cdot \sqrt{v}$

$v = 5\ m/s$

a) $n = 5 \qquad h = \frac{b-a}{5} = \frac{5-20}{5} = -3 \qquad x_i = a + ih = 20 - 3i$

$f(v) = -10\,v^{-3/2}$

$$Rf = h \cdot \left(\sum_{i=0}^{n-1} f\left(a + i \cdot h + \frac{h}{2}\right)\right)$$

$$= -3 \cdot \left(\sum_{i=0}^{4} f(20 - 3i - 1.5)\right) = 4.38231$$

Absoluter Fehler: $|I - Rf| = |4.38231 - 4.472136| = 0.0898$

b) $$Tf = h \cdot \left(\frac{f(a)+f(b)}{2} + \sum_{i=1}^{n-1} f(a+ih)\right) = 4.65818$$

Absoluter Fehler: $|I - Rf| = |4.65818 - 4.472136| = 0.18605$

c) $$SF = \frac{h}{3}\left(\frac{1}{2}f(a) + \sum_{k=1}^{n-1} f(x_k) + 2\sum_{k=1}^{n} f\left(\frac{x_{k-1}+x_k}{2}\right) + \frac{1}{2}f(b)\right) = 4.47427$$

Absoluter Fehler: $|I - Rf| = |4.47427 - 4.472136| = 0.002134$

c) genauer als a) genauer als b)