

Sec 5.1 page 341 (1-5, 12)

① a) Lower $L_4 = 2(2 + 3.75 + 5 + 5.75) = \boxed{33}$
Upper $R_4 = 2(3.75 + 5 + 5.75 + 6) = \boxed{41}$

b) Lower $L_8 = 1(2 + 2.9 + 3.75 + 4.4 + 5 + 5.4 + 5.75 + 5.9) = \boxed{35.1}$
Upper $R_8 = 1(2.9 + 3.75 + 4.4 + 5 + 5.4 + 5.75 + 5.9 + 6) = \boxed{39.1}$

② a) $\Delta x = \frac{12-0}{6} = 2$

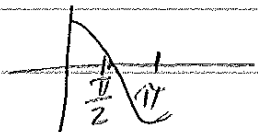
i) $L_6 = 2(9 + 8.8 + 8.2 + 7.3 + 5.9 + 4.1) = \boxed{86.6}$
ii) $R_6 = 2(8.8 + 8.2 + 7.3 + 5.9 + 4.1 + 1) = \boxed{70.6}$
iii) $M_6 = 2(9.9 + 8.5 + 7.8 + 6.6 + 5.1 + 2.8) = \boxed{79.4}$

b) $f \downarrow \therefore L_6$ is an overestimate

c) $f \downarrow \therefore R_6$ is an underestimate

d) M_6 is best since it appears to be close to average of $L_6 + R_6$ and f is \downarrow .

③ $f(x) = \cos x \quad \Delta x = \frac{\frac{\pi}{2} - 0}{4} = \frac{\pi}{8}$

 R_4 is an underestimate

$$R_4 = \sum_{k=1}^4 f(x_k) \Delta x \Rightarrow \frac{\pi}{8} (\cos \frac{\pi}{8} + \cos \frac{2\pi}{8} + \cos \frac{3\pi}{8} + \cos \frac{4\pi}{8})$$

$$= \boxed{0.7908}$$

$$\textcircled{3} L_4 = \sum_{i=1}^4 f(x_{i-1}) \Delta x$$

$$\Rightarrow \frac{\pi}{8} (\cos 0 + \cos \frac{\pi}{8} + \cos \frac{2\pi}{8} + \cos \frac{3\pi}{8}) = \boxed{1.1835}$$

$$\textcircled{4} a) f(x) = \sqrt{x} \quad \frac{4-0}{4} = 1 = \Delta x$$

$$R_4 = \sum_{i=1}^4 f(x_i) \Delta x = 1(1 + \sqrt{2} + \sqrt{3} + 2) \approx \boxed{6.1463}$$

Since $f \uparrow$ R_4 is overestimate

$$b) L_4 = \sum_{i=1}^4 f(x_{i-1}) \Delta x = 1(0 + 1 + \sqrt{2} + \sqrt{3}) \approx \boxed{4.1463}$$

Since $f \uparrow$ L_4 is underestimate

$$\textcircled{5} a) f(x) = 1+x^2 \quad \frac{2-1}{3} = 1 = \Delta x \quad \frac{2-1}{6} = \frac{1}{2} = \Delta x$$

$$R_3 = 1(f(0) + f(1) + f(2)) = 1 + 2 + 5 = \textcircled{8}$$

$$R_6 = \frac{1}{2}(f(-\frac{1}{2}) + f(0) + f(\frac{1}{2}) + f(1) + f(\frac{3}{2}) + f(2)) = \frac{1}{2}(1.25 + 1 + 1.25 + 2 + 3.25 + 5) = \textcircled{6.875}$$

$$b) L_3 = 1(f(-1) + f(0) + f(1)) = 2 + 1 + 2 = \textcircled{5}$$

$$L_6 = \frac{1}{2}(f(-1) + f(-\frac{1}{2}) + f(0) + f(\frac{1}{2}) + f(1) + f(\frac{3}{2})) = \frac{1}{2}(2 + 1.25 + 1 + 1.25 + 2 + 3.25) = \boxed{5.375}$$

$$c) M_3 = 1(f(-\frac{1}{2}) + f(\frac{1}{2}) + f(\frac{3}{2})) = 1.25 + 1.25 + 3.25 = \textcircled{5.75}$$

$$M_6 = \frac{1}{2}(f(-\frac{3}{4}) + f(-\frac{1}{4}) + f(\frac{1}{4}) + f(\frac{3}{4}) + f(\frac{5}{4}) + f(\frac{7}{4})) = \frac{1}{2}(1.5625 + 1.0625 + 1.0625 + 1.5625 + 2.5625 + 4.0625) = \textcircled{5.9375}$$

5a) Best estimate is M_6 .

12) a) $L_5 = 12(30 + 28 + 25 + 22 + 24) = 129(12) = 1548 \text{ ft}$

b) $R_5 = 12(28 + 25 + 22 + 24 + 27) = 126(12) = 1512 \text{ ft}$

c) Neither, v is neither an increasing or decreasing function of time.