

(a) Using the right endpoints to approximate $\int_3^9 f(x) dx$, we have

$$\sum_{i=1}^3 f(x_i) \Delta x = 2[f(5) + f(7) + f(9)] = 2(-0.6 + 0.7 + 1.8) = 3.8.$$

Since f is *increasing*, using *right* endpoints gives an *overestimate*.

(b) Using the left endpoints to approximate $\int_3^9 f(x) dx$, we have

$$\sum_{i=1}^3 f(x_{i-1}) \Delta x = 2[f(3) + f(5) + f(7)] = 2(-3.5 - 0.6 + 0.7) = -6.8.$$

Since f is *increasing*, using *left* endpoints gives an *underestimate*.

(c) Using the midpoint of each interval to approximate $\int_3^9 f(x) dx$, we have

$$\sum_{i=1}^3 f(\bar{x}_i) \Delta x = 2[f(4) + f(6) + f(8)] = 2(-2.3 + 0.3 + 1.5) = -1.$$

We cannot say anything about the midpoint estimate compared to the exact value of the integral.