1) Selected values of a function, f, are given in the table below:

x	0	5	8	9	12	18	20
f(x)	4	2	3	7	3	6	10

a) Give the middle approximation with 3 subintervals for f on the interval $[0, 20]$

b) Use right-handed rectangles to approximate the area with 3 subintervals for f on the interval $[0, 20]$

c) Use left-handed rectangles to approximate the area with 3 subintervals for f on the interval $[0, 9]$

d) Use trapezoids to approximate the area with 2 subintervals for f on the interval $[0, 20]$

2) Selected values of a function, f, are given in the table below:

x	1	3	7	10	12	13	16	17	20
f(x)	3	6	1	9	15	2	4	5	6

a) Give the middle approximation with 2 subintervals for f on the interval $[1, 20]$

b) Use right-handed rectangles to approximate the area with 3 subintervals for f on the interval $[3, 17]$

c) Use left-handed rectangles to approximate the area with 4 subintervals for f on the interval $[1, 12]$

d) Use trapezoids to approximate the area with 3 subintervals for f on the interval $[3, 17]$

Key

1) Selected values of a function, f, are given in the table below:

x	0	5	8	9	12	18	20
f(x)	4	2	3	7	3	6	10

a) Give the middle approximation with 3 subintervals for f on the interval $[0, 20]$

$$\text{Area} \approx 8(2) + 4(7) + 8(6)$$
$$16 + 28 + 48 = \boxed{92}$$

b) Use right-handed rectangles to approximate the area with 3 subintervals for f on the interval $[0, 20]$

$$\text{Area} \approx 8(3) + 4(3) + 8(10)$$
$$24 + 12 + 80 = \boxed{116}$$

c) Use left-handed rectangles to approximate the area with 3 subintervals for f on the interval $[0, 9]$

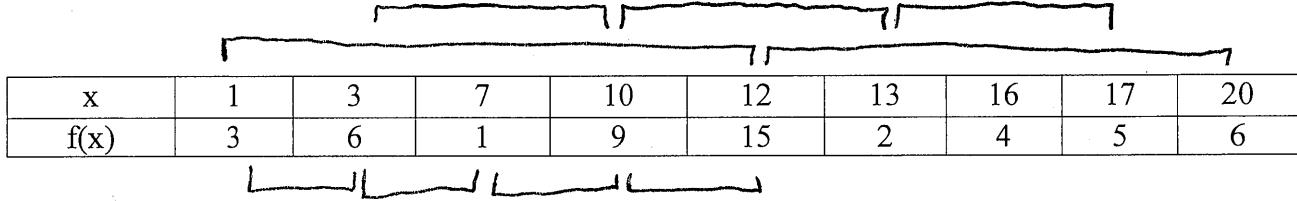$$\text{Area} \approx 5(4) + 3(2) + 1(3)$$
$$20 + 6 + 3 = \boxed{29}$$

d) Use trapezoids to approximate the area with 2 subintervals for f on the interval $[0, 20]$

$$\text{Area} \approx \frac{9}{2}\left[4+7\right] + \frac{11}{2}\left[7+10\right]$$
$$\frac{w}{2}\left[h_1 + h_2\right] \qquad \frac{99}{2} + \frac{187}{2} = \boxed{143}$$

2) Selected values of a function, f, are given in the table below:

x	1	3	7	10	12	13	16	17	20
f(x)	3	6	1	9	15	2	4	5	6

a) Give the middle approximation with 2 subintervals for f on the interval [1, 20]

$$Area \approx 11(1) + 8(4)$$

$$11 + 32 = \boxed{43}$$

b) Use right-handed rectangles to approximate the area with 3 subintervals for f on the interval [3, 17]

$$Area \approx 7(9) + 3(2) + 4(5)$$

$$63 + 6 + 20 = \boxed{89}$$

c) Use left-handed rectangles to approximate the area with 4 subintervals for f on the interval [1, 12]

$$Area \approx 2(3) + 4(6) + 3(1) + 2(9)$$

$$6 + 24 + 3 + 18 = \boxed{51}$$

d) Use trapezoids to approximate the area with 3 subintervals for f on the interval [3, 17]

$$Area \approx \frac{7}{2}[6+9] + \frac{3}{2}[9+2] + \frac{4}{2}[2+5]$$

$$\frac{w}{2}[h_1 + h_2]$$

$$52.5 + 16.5 + 14 = \boxed{83}$$