Midpoint/Trapezoid Rule- Key

Estimate the area using the Midpoint/Trapezoidal rule between the graph of the function and the x-axis for problems 1 - 8.

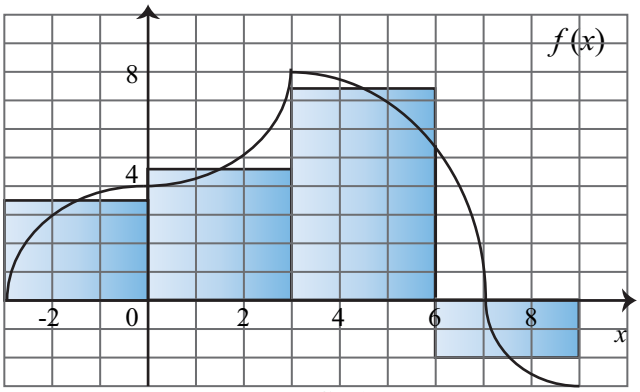

FIG - 1

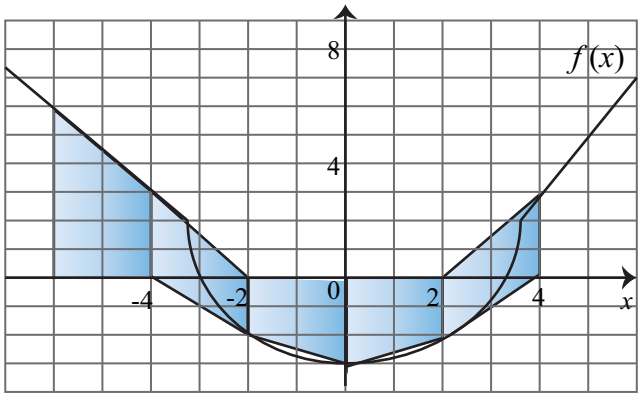

FIG - 2

1. Using Midpoint(3) for $f(x) = x^2 - 2x$ in $[0, 3]$.
   Ans: -0.25

2. Using Trapezoid(3) for $f(x) = x^2 - 2x$ in $[0, 3]$.
   Ans: 0.5

3. Using Midpoint(3) for $f(x) = \sin(2x)$ on $\left(0, \frac{3\pi}{4}\right)$.
   Ans: $\frac{\pi}{4\sqrt{2}}$

4. Using Trapezoid(2) for $f(x) = \cos(4x)$ on $\left(0, \frac{\pi}{8}\right)$.
   Ans: $\left(\frac{1}{2} + \frac{3}{2\sqrt{2}}\right)\frac{\pi}{16}$

5. Shade and estimate Midpoint(4) in Fig-1 for $f(x)$ in $[-3, 9]$.
   Ans: 41.1

6. Shade and estimate Trapezoid(5) in Fig-2 for $f(x)$ in $[-6, 4]$.
   Ans: 1

7. Using Midpoint sum for $f(x)$ in $[-1, 10]$

x	-1	3	4	6	10
$f(x)$	5	-2	3	5	7

   Ans: Cannot be determined.

8. Using Trapezoid rule for $f(x)$ in $[3, 10]$

x	-1	3	4	6	10
$f(x)$	5	-2	3	5	7

   Ans: 38.5

9. For $f(x) = xe^{-x}$ on $[2, 8]$, is Midpoint sum gives an over estimate?
   $f(x)$ concave down $\implies$ Midpoint sum gives overestimate.

10. For $f(x) = x^2 + \ln(x^2)$ on $[0, 1]$, is Trapezoid rule an over estimate?
    $f(x)$ concave up $\implies$ Trapezoid rule gives overestimate.