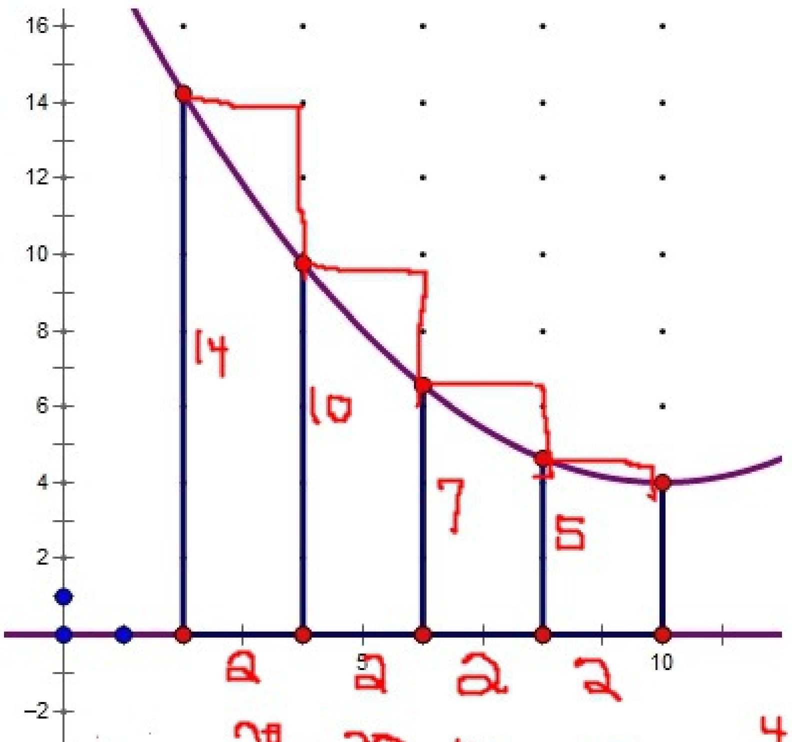
Notes on Reimann "Boxes" & Sums



28 20 14 10

Vocabulary & Symbols

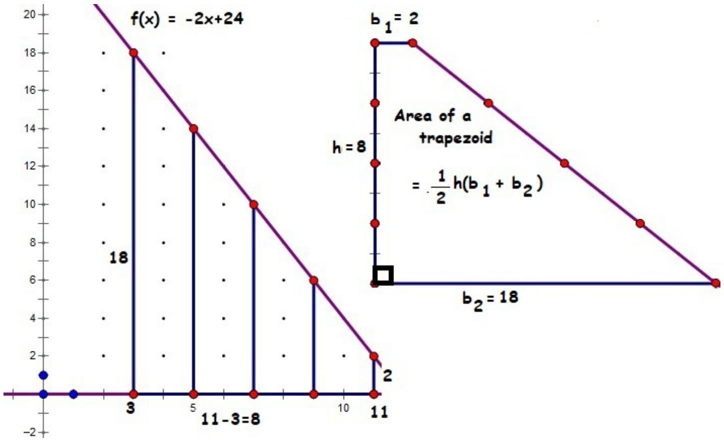
real number info

f(x) -- a function defined over the Reals on the interval [a,b]
[a,b] -- the interval from a to b including a and b, as in a<= x <= b
n -- the number of sub-intervals in [a,b]
delta x -- the width of each sub-interval, (b-a)/n
i -- interval counter, really sub-interval counter
P -- the partition of the plane divided by the n sub-intervals
P = { [a=x0, x1], [x1, x2], [x2, x3], ..., [xn-3, xn-2], [xn-2, xn-1], [xn-1, xn=b]}
(x*i , f(x*i)) -- a representative x in an interval & its matching function value, height
x*i might be the
LEFT-most x in the interval, or the
RIGHT-most x in the interval, or the
MIDPOINT of the interval, or
some other chosen representative x

On the graph at the left,
1. State: a. f(x) f(x) b. [a,b] [2,10] c. n 4 d. delta x 2
2. Draw a rectangular box in each interval
   a. with a width of delta x, the width of the entire interval,
   b. with a height of the LEFT-most f(x) for a LEFT Reimann sum,
      with a height of the RIGHT-most f(x) for a RIGHT Reimann sum,
      with a height of the MIDPOINT's f(x) for a MIDPOINT sum,
      with a height of the f(x) of some chosen representative x
3. For each box, compute the area of the box based on the numbers on the graph.
4. Add the areas. This is the Reimann sum.

$$\sum_{i=1}^{4} f(x_i^*)\,\Delta x = 72$$

A Look at the Area Under f(x) = -2x + 24, 3 $\leq$ x $\leq$ 11 from Many Points of View



1. Complete the computation for the area of a trapezoid to find the area under f(x) = -2x + 24, 3 $\leq$ x $\leq$ 11.

A = (1/2)(h)(b_1 + b_2)
A = (1/2)(8)(2+18) = 4(20)=80

2. Complete the computation of the definite integral to find the area under the curve f(x) = -2x + 24, 3 $\leq$ x $\leq$ 11.

$$\int_3^{11}(-2x+24)dx = [-x^2+24x]_3^{11} =$$

$$[-x^2+24x]^{11} - [-x^2+24x]_3 =$$

$$[-(11)^2+24(11)] - [-(3)^2+24(3)] =$$

$$[-121+264] - [-9+72] =$$

$$[-143] - [63] = 80$$

3. Draw Reimann boxes for the RIGHT Reimann sum and the MIDPOINT Reimann sum. Compute the areas. Compute the sums to approximate the area under f(x) = -2x + 24, 3 $\leq$ x $\leq$ 11.