Teacher Notes

A c t i v i t y   1 5

Area Under the Curve

Problem

Given any function, the area under its graph from some fixed value to any other value creates a new function. This function is related to the original function by integral calculus. In this activity, the general rule for the integral of polynomials will be examined.

Exploration

8.

Upper Limit	Numerical Integral
1	0.5
2	2
3	4.5
4	8
-1	0.5
-2	2
-3	4.5
-4	8

9. 0. Because the area under the curve from 0 to 0 is 0.

10. The value of the numerical integral increases because the area is positive and increasing.

11. The value of the numerical integral increases. This is true because the area is getting larger. Additionally, the area is beneath the x-axis and the summation is from right to left.

12. $g(x) = \dfrac{1}{2} x^2$.

13. They are the same.

14. The original function $f(x)$ can be obtained by finding the derivative of the function $g(x)$ or $h(x)$.

Additional Exercises

1.

Upper Limit	Numerical Integral
0	0
1	1
2	8
3	27
4	64
5	125
-1	-1
-2	-8
-3	-27
-4	-64
-5	-125

Model for Integral: $g(x) = x^3$

2.

Upper Limit	Numerical Integral
0	0
1	.75
2	12
3	60.75
4	192
5	468.75
-1	.75
-2	12
-3	60.75
-4	192
-5	468.75

Model for Integral: $g(x) = \frac{3}{4} x^4$.

3.

Upper Limit	Numerical Integral
0	0
1	.4
2	12.8
3	97.2
4	409.6
5	1250
-1	-.4
-2	-12.8
-3	-97.2
-4	-409.6
-5	-1250

Model for Integral: $g(x) = \frac{2}{5} x^5$

4. $g(x) = \frac{ax^{n+1}}{n+1}$.