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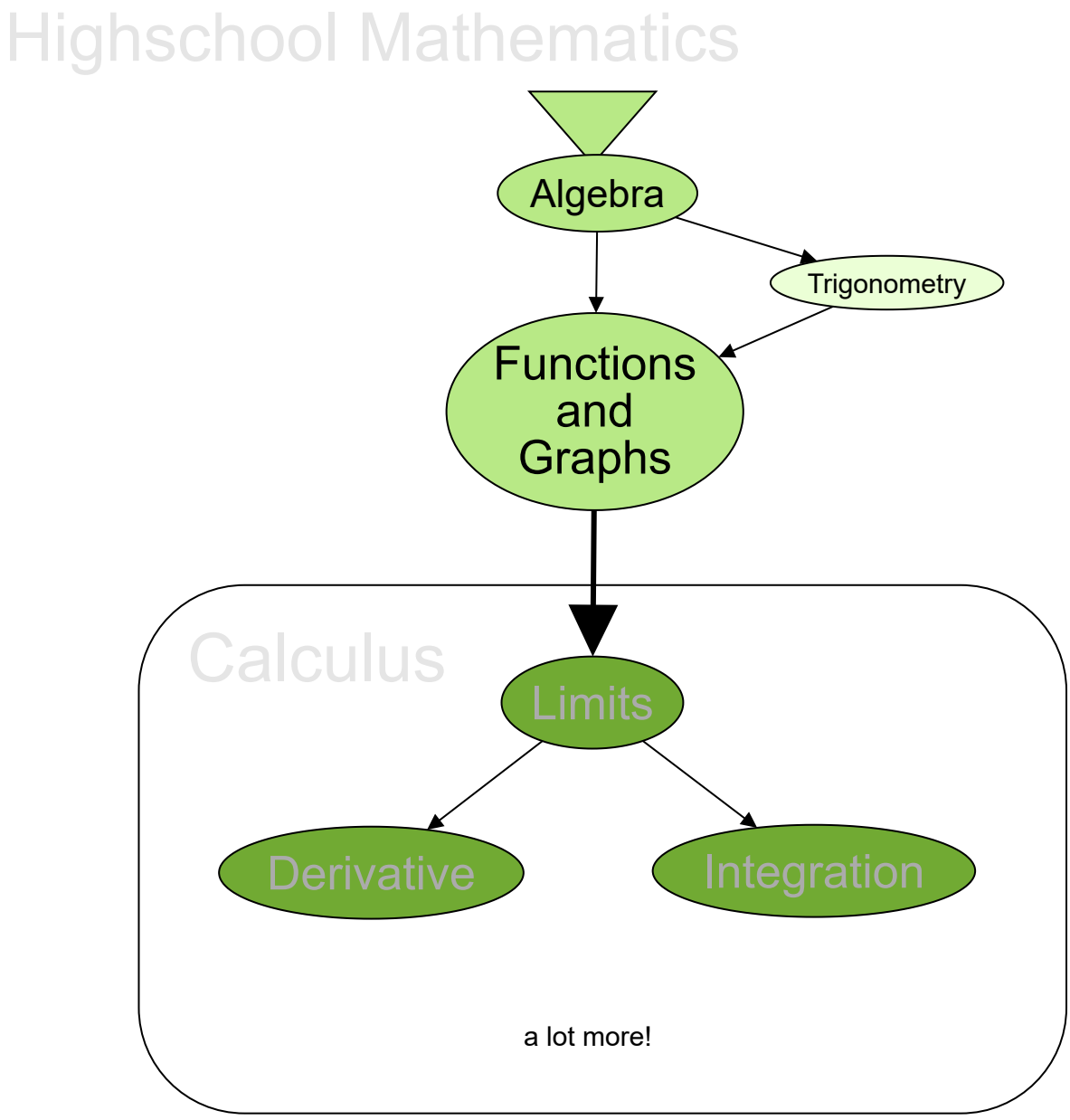
1. Map

1.1. FlowChart



1.2. Lesson Plan

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Lesson 1: Functions and Graphs

1) Definition of Function
2) Evaluating a Function
3) Graphing a Function
4) Finding Domain and Range of a Function
5) X-intercerpt and Y-intercept
6) Operations on Functions
7) Symmetry of Functions
8) Inverse of a Function
9) Types of Functions
10) Graphical Translation of a Function
11) Analysis of Polynomial Functions
12) Analysis of Radical Functions
13) Analysis of Rational Functions

Lesson 2: Limits and Continuity

1) Graphical approach to limits of functions
2) Definition of the limit of a function and limit theorems
3) One-sided limits
4) Infinite limits
5) Limits at infinity
6) Continuity of a function at a number
7) Continuity of a composite function
8) Continuity on an Interval

Lesson 3: Derivatives and Differentiation

1) Definition of derivative
2) Differentiability vs continuity
3) Theorems on differentiation of algebraic functions
4) Derivatives as the rate of change
5) Theorems on differentiation of transcendental functions
6) Chain rule
7) Derivatives of the power function for rational exponents
8) Higher-order derivatives
9) Implicit differentiation

Lesson 4: Integration

1) Definition of integration
2) Theorems on indefinite integrals
3) Theorems on definite integrals
4) Integrals of transcendental functions
5) Techniques of integration

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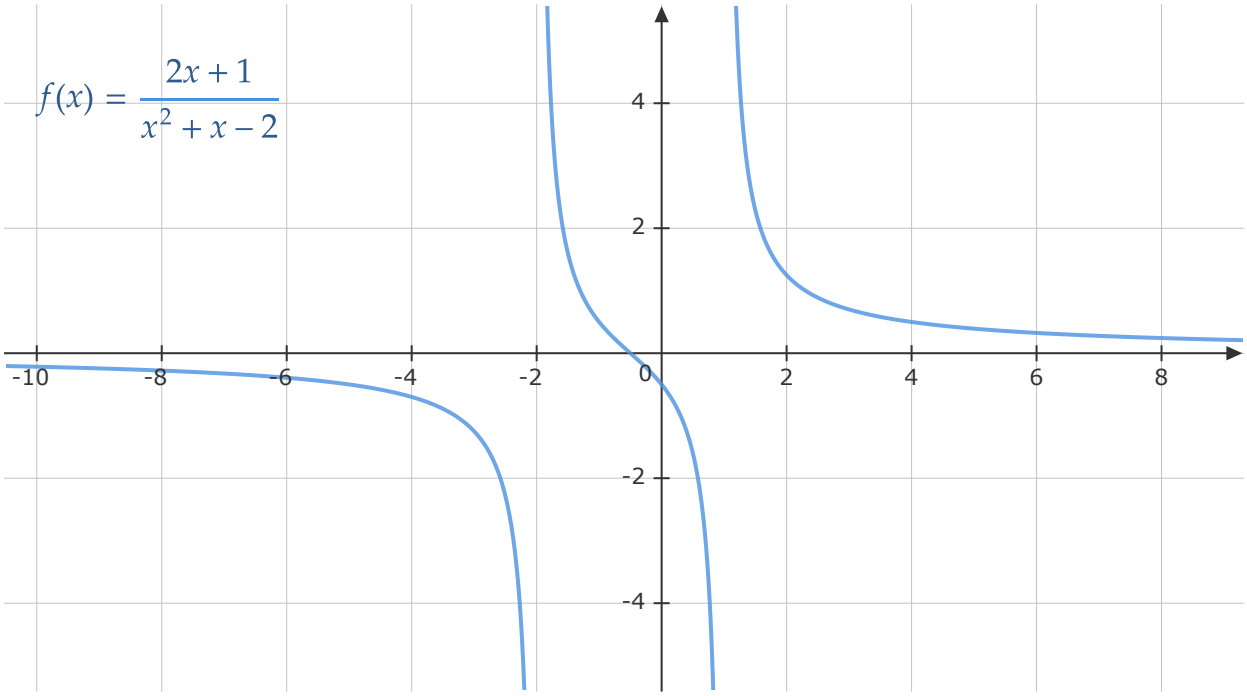
2. Functions and Graphs

Function is the core prerequisite to calculus. It is the mathematical representation of input x plugging it into a function f to produce an output $f(x)$.

A function value $f(x)$ tells the exact output value when plugging x as an input.

2.1. Exercises



Exercise 1. Using the graph above, evaluate the following:

1) $f(4)$
2) $(f+f)(3)$
3) $f(-3+2)$
4) $f(1)$

Evaluate 2. Using the graph above, find the following under $f(x)$:

1) x-intercept
2) y-intercept
3) Domain
4) Range
5) Horizontal asymptote
6) Vertical asymptote

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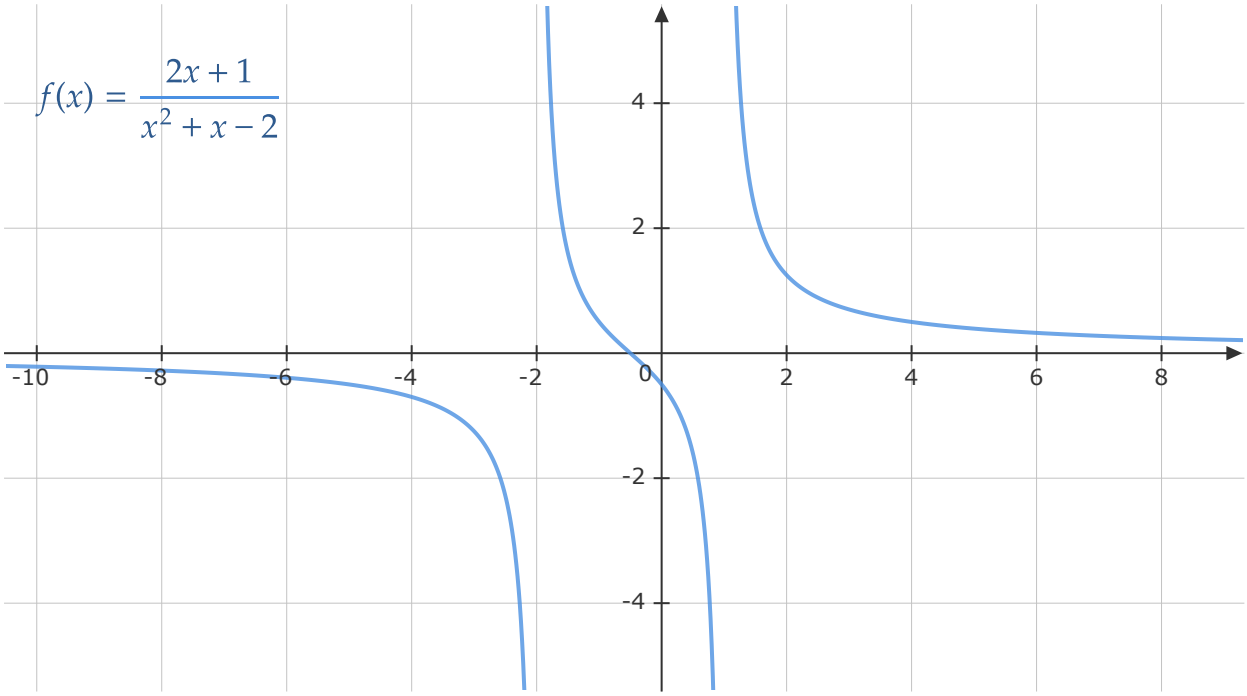
3. Limits and Continuity

The limit of a function $\lim_{x \to a} f(x)$ tells what is the approaching output value to $f(a)$.

3.1. Exercises



Exercise 1. Using the graph above, evaluate the following:

1) $\lim_{x \to 4} f(x)$
2) $\lim_{x \to 1^+} f(x)$
3) $\lim_{x \to 1^-} f(x)$
4) $\lim_{x \to 1} f(x)$
5) $\lim_{x \to -2^+} f(x)$
6) $\lim_{x \to -2^-} f(x)$
7) $\lim_{x \to -2} f(x)$
8) $\lim_{x \to \infty} f(x)$

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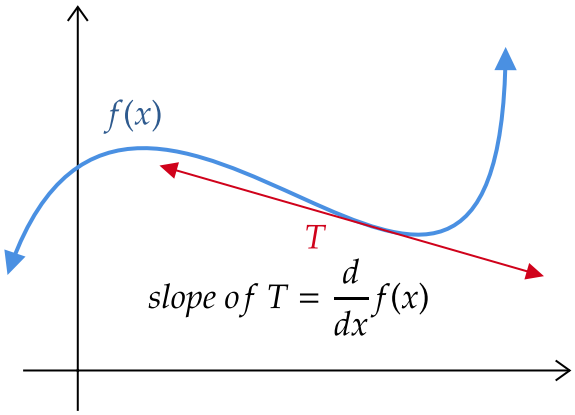
9) $\lim_{x \to -\infty} f(x)$

10) Is the function $f(x)$ continuous at $x = 0$?

4. Derivatives

The derivative of a function $f(x)$ with respect to x, written as $\frac{d}{dx}f(x)$, produces the instantaneous rate of change of $f(x)$ as x changes. In a graphical approach, $\frac{d}{dx}f(x)$ is the slope of a function's tangent line T at any point $(x, f(x))$.



4.1. Exercises

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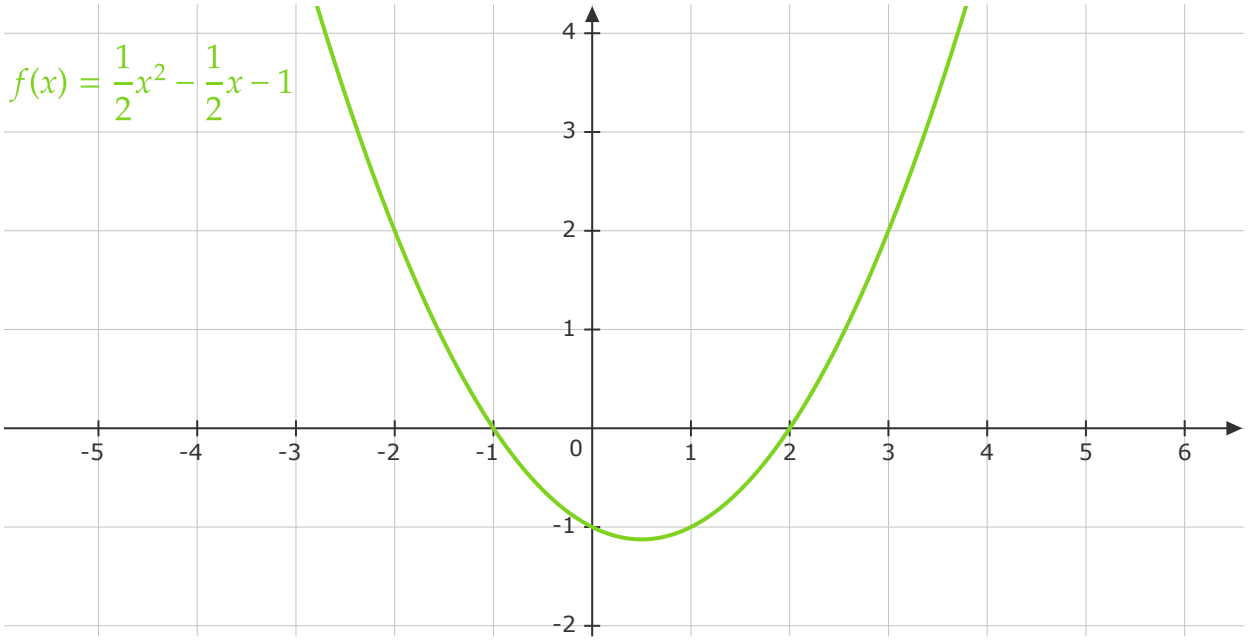

Exercise 1. Using the graph above, evaluate the following:

1) $\frac{d}{dx}f(x)$
2) $\frac{d}{dx}f(3)$
3) $\frac{d^2}{d^2x}f(3)$
4) Minimum value of $f(x)$

Exercise 2. Evaluate the following:

1) $\frac{d}{dx}[2\sin(x) + 3\tan(x)]$
2) $\frac{d}{dx}\left[3\left(x^3 - 2x + 1\right)^2 + x\right]$
3) $\frac{d^2}{d^2x}\left(4x^6 + 7x - 2\right)$
4) $\frac{d}{dx}\left[\left(x^2 - 2\right)(x + 3)\right]$
5) $\frac{d}{dx}\left(\frac{x+1}{x+2}\right)$
6) $\frac{d}{dy}\left[3x^2 + 2y + y\right]$

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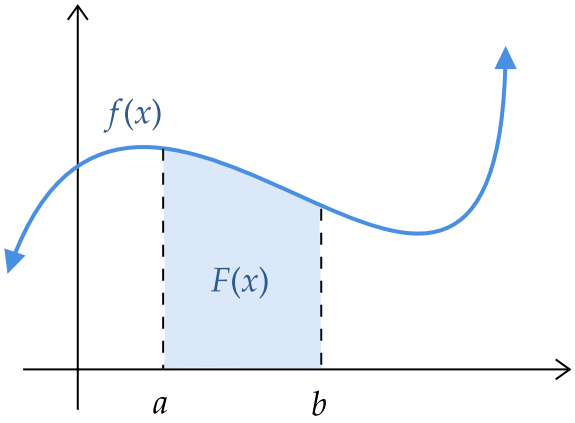
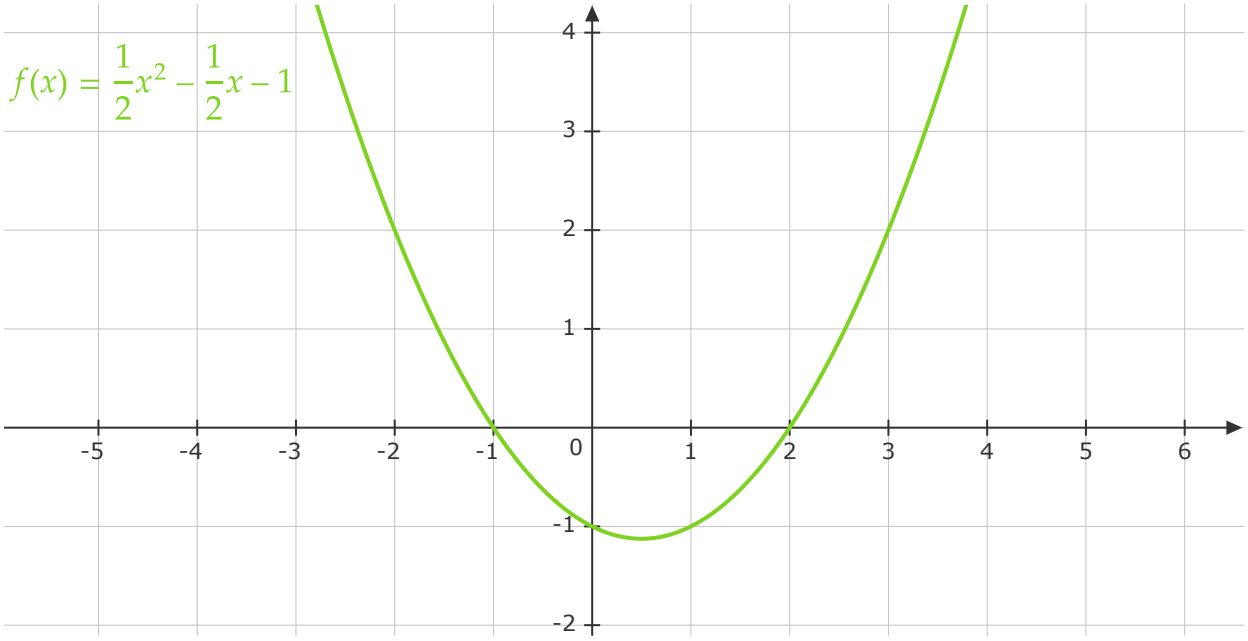
5. Integration

Integrating $f(x)$ with respect to dx from a to b, written as $\int_a^b f(x)dx$, produces the $F(x)$ as the antidifferentiation of $f(x)$. In a graphical approach, $F(x)$ is the area bounded by $f(x)$, $x = a$, $x = b$, and the x-axis.



5.1. Exercises



Exercise 1. Using the graph above, evaluate the following:

1) $\int f(x)dx$

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2) $\int_2^4 f(x)dx$

3) $\int_0^3 f(x)dx$

4) $\int_4^2 f(x)dx$

Exercise 2. Without using the graph, evaluate the following:

1) $\int \left[3\sin(u) + u^2\right]du$

2) $\int_{-7}^{-7} \left(x^2 + 3x + 1\right)dx$

3) If $f(x) = 2x^2 - 3$ and $g(x) = 5x - 2$, what is $\int [(f+g)(x)]dx$?

4) $\int (3x+2)^2 dx$

5) $\int \frac{1}{\left(x^2+5x\right)^7}dx$

6) $\int x^2\left(x^3-1\right)^4 dx$

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Sources

For outlining content of my work:

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