MAT137 Lecture 23

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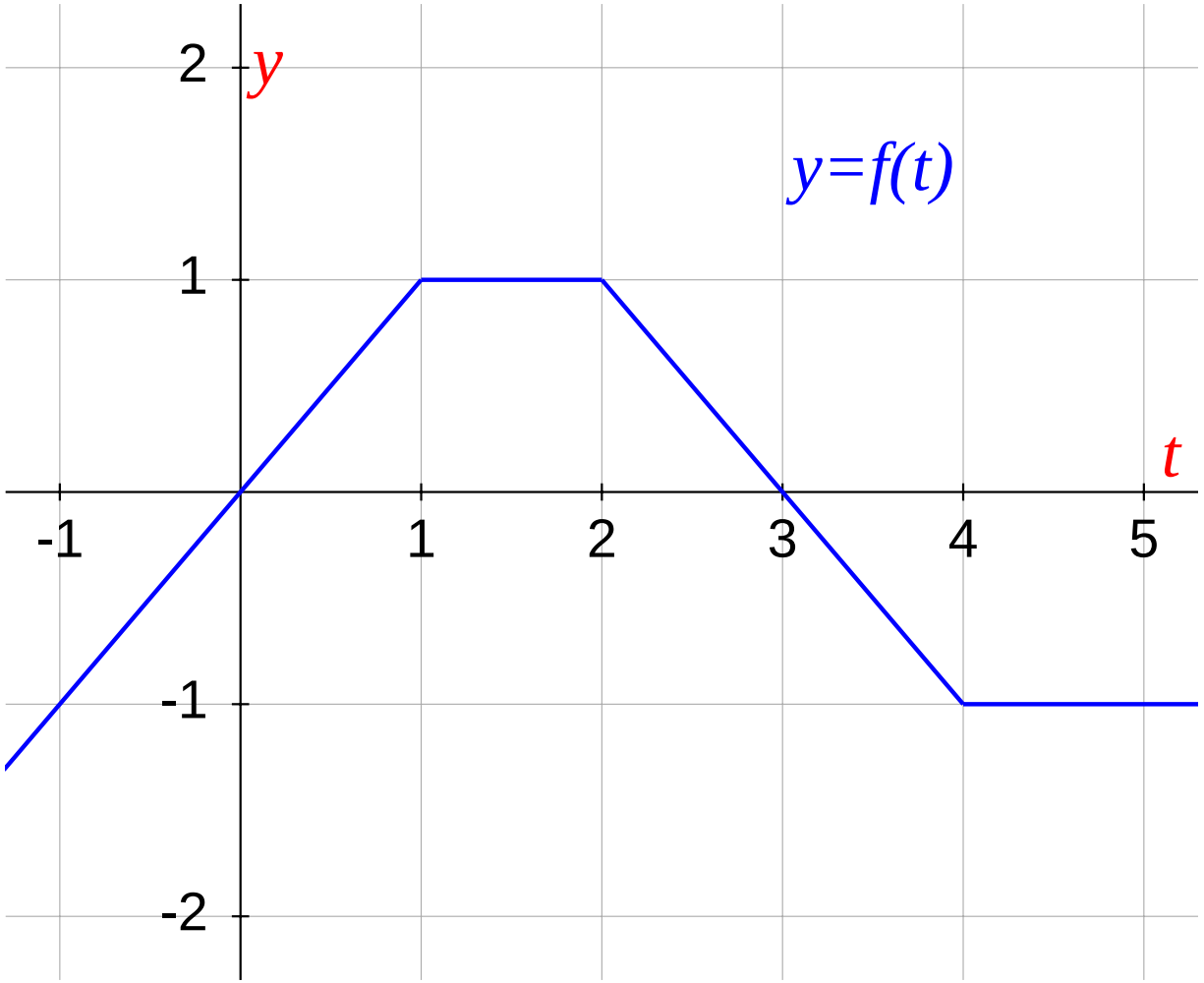
Agenda

Antiderivatives, indefinite integrals.

Towards indefinite integrals



Compute:

(a) $\int_0^1 f(t)dt$

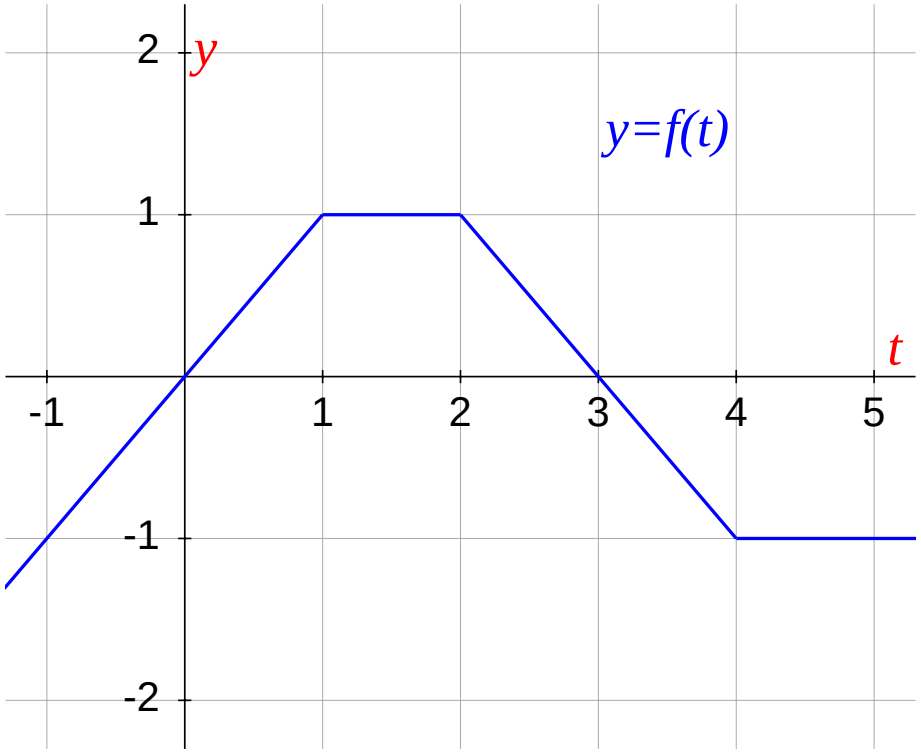
(b) $\int_0^2 f(t)dt$

(c) $\int_0^3 f(t)dt$

(d) $\int_0^4 f(t)dt$

(e) $\int_0^5 f(t)dt$

Towards indefinite integrals



Call $F(x) = \int_0^x f(t)dt$. This is a new function.

Sketch the graph of $y = F(x)$.

Sketch the graph of $y = F'(x)$.

The Fundamental Theorem of Calculus Part 1

Theorem

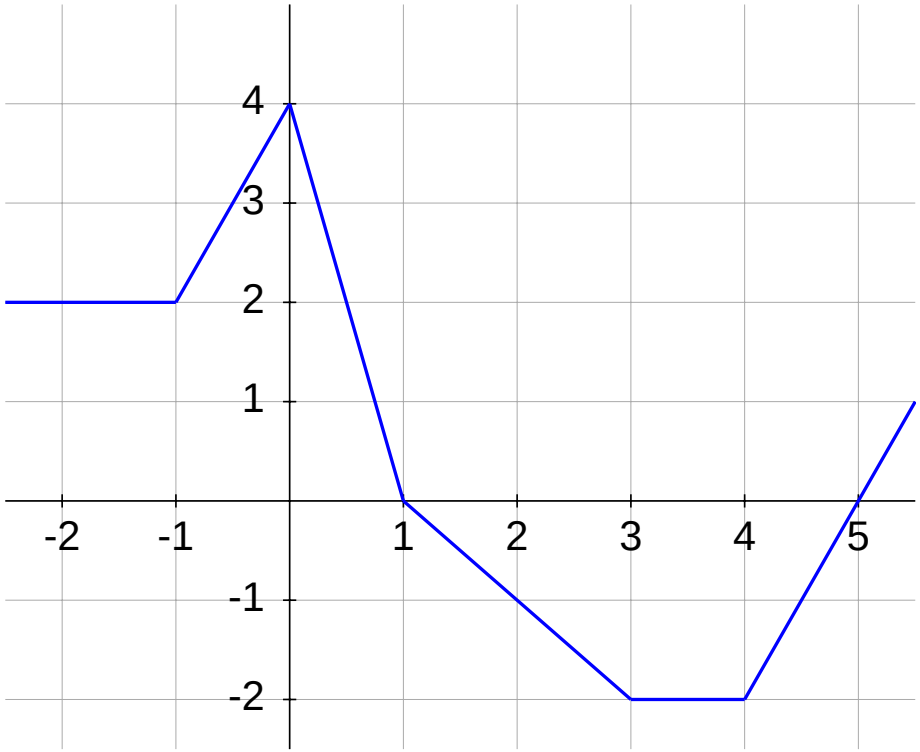
Let I be an interval. Let $a \in I$. Let f be a function on I. We define

$$F(x) = \int_a^x f(t)dt.$$

Then F is continuous on I.
Moreover, if f is continuous, then F is differentiable and $F' = f$. In short, F is an anti-derivative of f.

The Fundamental Theorem of Calculus Part 1

Let $g(x) = \int_0^x f(t)dt$ where f is the function whose graph is shown



(a) Evaluate $g(-2)$, $g(-1)$, $g(0)$, $g(1)$, $g(3)$, $g(4)$, $g(5)$.

(b) On what interval is g increasing?

(c) Where does g have a maximum value?

(d) Sketch a rough graph of g.

Antiderivatives

Find the following antiderivatives

(a) $\int (3 - t^{2018})\sqrt{t^3}dt$

(b) $\int \sin(3x)dx$

(c) $\int \frac{1}{9 + 4t^2}dt$

(d) $\int \frac{1}{\sqrt{1 - 9x^2}}dx$

(e) $\int \sec^2(2t + 1)dt$

(f) $\int \sec(x)\tan(x)dx$

Next Class: Thursday January 18

Watch videos 8.3, 8.4, 8.5, 8.6, 8.7 in Playlist 8.