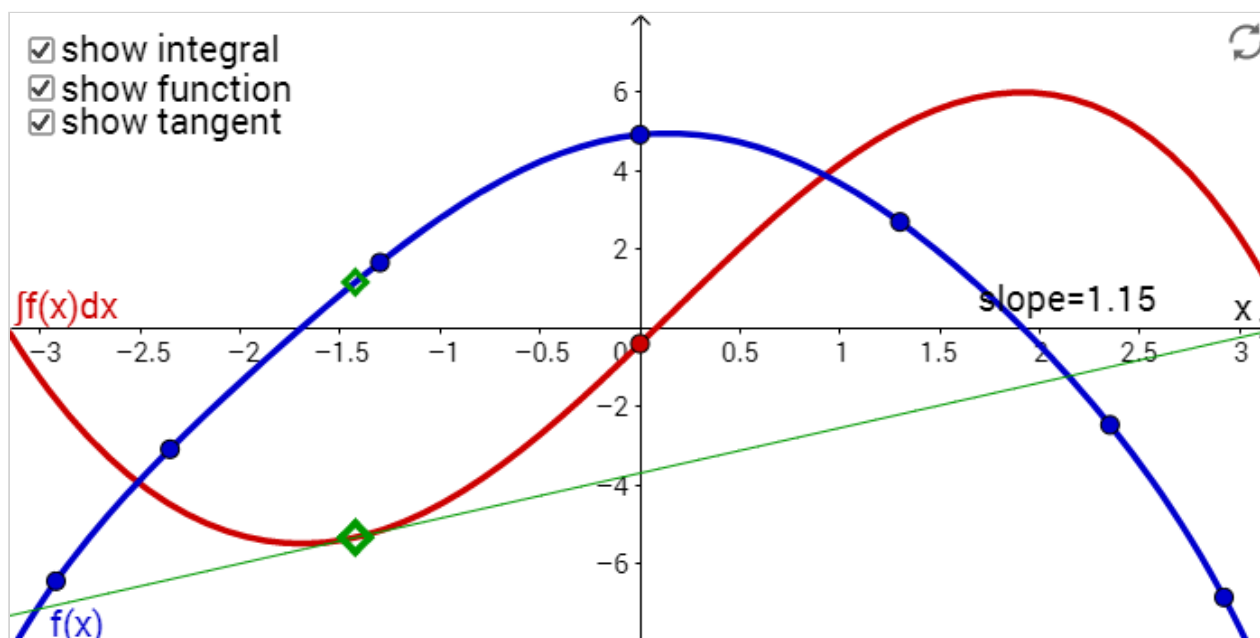# Math Insight

Developing intuition about the indefinite integral

Indefinite integral of interpolating polynomial. The blue curve is the graph of a polynomial $f(x)$. You can change f by dragging the blue points, as f is an interpolating polynomial through those points. The indefinite integral $\int f(x)dx$ of the function $f(x)$ is shown by the red curve. Since the slope of tangent line to the integral is the function itself, the integral $\int f(x)dx$ increases when the function f is positive, is horizontal where the function f is zero, and is decreasing where the function f is negative. Since the integral $\int f(x)dx$ is determined only up to a constant, you can raise or lower the function by dragging the red point up and down. All these vertical translations of the red curve are the integral of f. To test your ability to estimate the integral from the function, you can uncheck the "show integral" checkbox and attempt to sketch what you think the integral is. Alternatively, you can uncheck the "show function" checkbox to test your ability to sketch the function from its integral.

More information about applet.

$$\int f(x)dx = \frac{1}{3}\,x^3 + C$$

f(x)=x²

f(x)

☑ show integral
☑ show function
☑ show tangent

slope=1.25
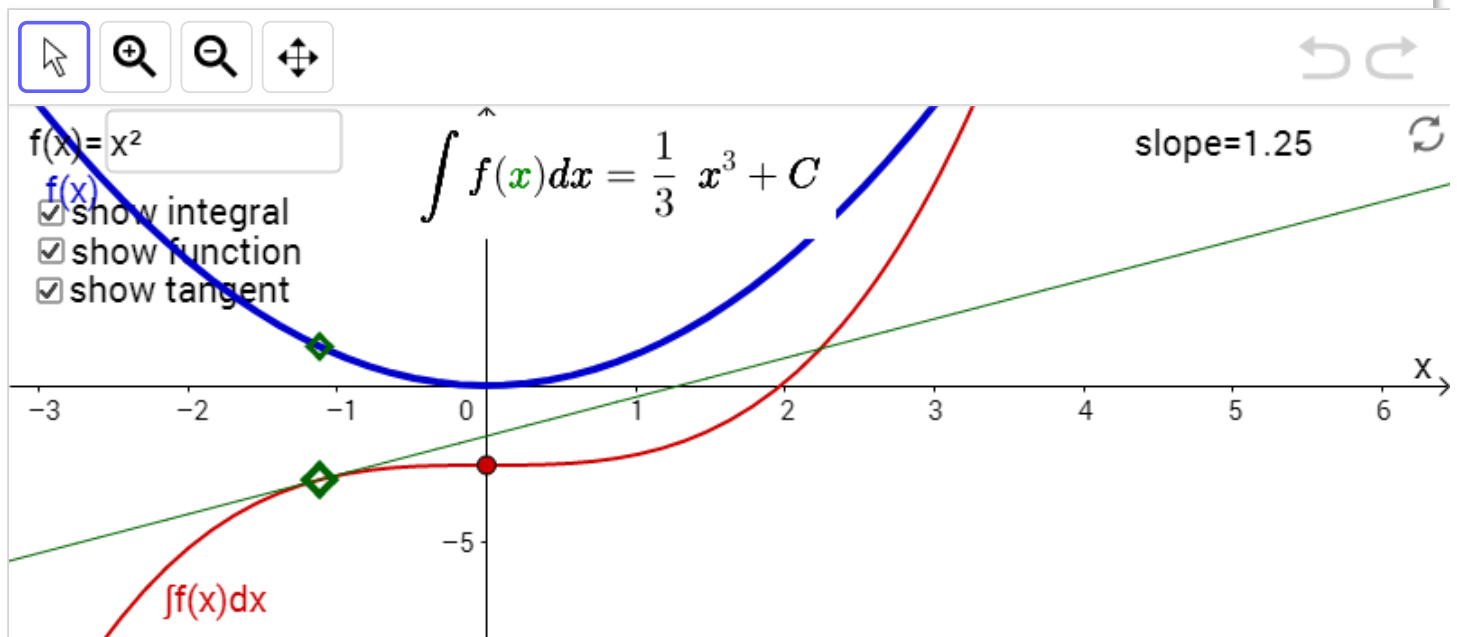
∫f(x)dx

Indefinite integral of a function. The function $f(x)$ is plotted by the thick blue curve. If it can be calculated, the function's indefinite integral $\int f(x)dx$ is shown by the thin red curve. You can move the large green diamond along the graph of $\int f(x)dx$ by dragging with your mouse; its x-coordinate is x_0. A tangent line to $\int f(x)dx$ calculated at $x = x_0$ is shown by the green line. Its slope is the value $f(x_0)$ of the function f itself evaluated at $x = x_0$. This slope is also displayed by the smaller green diamond on the graph of f, which is at the point $(x_0, f(x_0))$. As you change x_0, this smaller diamond representing the slope traces out the graph of the function itself. You can change $f(x)$ by typing a new value in its box. The value of $\int f(x)(x)$ is displayed to the right of the box. Since you can always add an arbitrary constant C to the integral, you can move the graph of $\int f(x)dx$ up and down by dragging the red point. You can hide items by unchecking the corresponding check boxes in order to test yourself on how well you can determine the indefinite integral from the function or vice versa. You can use the buttons at the top to zoom in and out as well as pan the view.

More information about applet.

Cite this as

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Keywords: indefinite integral, integral, single integral