

Ex 1. Compute the following definite integrals:

a) $\int_0^{\frac{\pi}{2}} \cos(x) + 1 \, dx =$

b) $\int_1^e \frac{1}{x} + 2x \, dx =$

c) $\int_1^2 \frac{x^5 + 6\sqrt{x} - 1}{x^2} \, dx$

Ex 2. Compute the derivative of the following functions:

a) $g(x) = \int_0^x \sqrt{1+t^2} \, dt$

b) $h(x) = \int_1^{\sin x} \sqrt{1+t^2} \, dt$

c) $g(s) = \int_{\sqrt{s}}^1 \arctan(u) \, du$

Ex 3. Compute the indefinite integral $\int \frac{3}{x} + 2 \sin(x) + \frac{e^x}{4} \, dx$.

Ex 4. A ball is thrown upward at a speed of 48 feet per second from the edge of a cliff 432 feet above the ground.

- Find its height above ground t seconds later.
- When does it reach its maximum height?
- When does it hit the ground?

Ex 5. Sketch the graph of a function f that satisfies **all of the given conditions**:

- $\int_{-4}^x f(t) \, dt \geq 0$ for all $-4 < x < 0$.
- $\lim_{x \rightarrow 0^-} f(x) = \infty$;
- $f(0) = 2$;
- $f'(2) = 0$;
- $f'(x) < 0$ on $(2, \infty)$;
- $\lim_{x \rightarrow \infty} f(x) = -1$.

Make sure that your graph is the graph of a function, i.e. it passes the vertical line test.

