1. Acceleration due to gravity is a constant 9.8 m/s^2.

(a) If you jump out of a window, find your velocity $v(t)$ at time t.

(b) Find your position $s(t)$ at time t.

(c) Suppose the window is 30 meters high and you jump *up* with a velocity of 2 m/s. Find the function $s(t)$ that describes your position at time t.

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2. Find an antiderivative for the given function.

(a) $4x^3 + 2x + 7$ (b) $4x^{-3} + 2x + 1$ (c) $2x^{-1}$

(d) e^{π^e} (e) $\dfrac{1}{\sqrt{1-x^2}}$ (f) e^{2x}

(g) xe^x (h) $\cos(x)\sin(x)$

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3. Solve the differential equation

$$\frac{dy}{dx} + \sin(x) - x = 0.$$

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4. In this problem we solve the differential equation

$$\frac{dy}{dx} = k(C - y).$$

(a) Pretend "dy" and "dx" are numbers that you may manipulate. Solve so that dy and y are on the same side of the equation and dx on the other side.

(b) Find antiderivatives for each side (finding an antiderivative for $f(y)dy$ means find a function $F(y)$ whose derivative is $f(y)$. Do the same for the dx side).

(c) Solve the resulting equation for y.

(d) Suppose y is the temperature of a room and x is time. Interpret the differential equation and its solution.