1.1 question 20: Verify that \( y(x) \) satisfies the given d.e.

\( y' = x - y; \hspace{1cm} y(x) = Ce^{-x} + x - 1; \hspace{1cm} y(0) = 1. \)

\( a) \hspace{1cm} \frac{dy}{dx} = x - y > 0 \hspace{1cm} y = x - Ce^{-x} + 1 \)

These are equal.

\( b) \hspace{1cm} y(0) = Ce^0 + 0 - 1 = C - 1 = 1 \)

so \( C = 2. \)
1.1 question 20: Verify that $y(x)$ satisfies the given d.e. Find a value of $C$ so that $y(x)$ satisfies the given initial condition. Sketch several typical solutions of the d.e. and highlight the one that satisfies the given initial condition.

$y' = x - y$; $y(x) = Ce^{-x} + x - 1$; $y(0) = 1$.

Class Activity!!!

If $y(0) = 10$, what is $C$?

a. $e^{10}$
b. 9
c. 10
d. 11 ✓
e. None of the above.
Some equations in the text.

Example 3: Newton’s law of cooling where the body temperature is $T(t)$ and the ambient temperature is $A$.

$$\frac{dT}{dt} = k(T - A)$$

We don’t need to know Example 4: Torricelli’s law.

Example 5: the size of a population $P(t)$ with constant birth and death rates.

$$\frac{dP}{dt} = kP.$$
Section 1.1 question 29.
Write a differential equation $\frac{dy}{dx} = f(x, y)$ having a function $g$ as one of its solutions, where $g$ is described by:
Every straight line normal to the graph of $g$ passes through the point $(0, 1)$.

We find a tangent vector to the graph. The vector $(1, \frac{dy}{dx})$ has slope $\frac{dy}{dx}$. This points in the tangent direction.

The normal line passes through $(0, 1)$ and $(x, g(x))$ so $(x, g(x) - 1)$ points in the normal direction.

Equation: $(1, y') \cdot (x, y - 1) = 0$

$x + y'(y - 1) = 0$ is the required d.e.