1. (1 pt)
Solve the following first-order differential equation:
\[
\frac{dy}{dx} = \frac{y}{5x}
\]
Simplify your answer completely. Your answer should look like \( y = f(x) \). If an arbitrary constant appears in your answer, you must enter it as an uppercase C. For example, a valid answer for the differential equation \( \frac{dy}{dx} = y \) would look like \( Ce^x \).

\( y = \) _______________

2. (1 pt)
Solve the following first-order differential equation:
\[
\frac{dy}{dx} = -4xy
\]
Simplify your answer completely. Your answer should look like \( y = f(x) \). If an arbitrary constant appears in your answer, you must enter it as an uppercase C. For example, a valid answer for the differential equation \( \frac{dy}{dx} = y \) would look like \( Ce^x \).

\( y = \) _______________

3. (1 pt)
Solve the differential equation
\[
\frac{dx}{dt} = e^x \sin(t)
\]
Simplify your answer completely. Your answer should look like \( x = f(t) \). If an arbitrary constant appears in your answer, you must enter it as an uppercase C. For example, a valid answer for the differential equation \( \frac{dx}{dt} = x \) would look like \( Ce^t \).

\( x = \) _______________

4. (1 pt)
Solve the differential equation:
\[
\frac{dy}{dx} - 6y = 4
\]
Simplify your answer completely. Your answer should look like \( y = f(x) \). If an arbitrary constant appears in your answer, you must enter it as an uppercase C. For example, a valid answer for the differential equation \( \frac{dy}{dx} = y \) would look like \( Ce^x \).

\( y = \) _______________

5. (1 pt)
The differential equation \( m \frac{dv}{dt} = mg - kv \) expresses Newton’s second law of motion, where \( m \) is the mass of a falling object, \( g \) is the acceleration due to gravity, \( k \) is a positive constant, and \( v = v(t) \) is the velocity of the object at time \( t \).

Solve the differential equation, subject to the initial condition \( v(0) = 0 \). Choose the answer from the list below.

\( v(t) = \)
A. \( \frac{mg}{k} \)

6. (1 pt)
Solve the separable first-order differential equation:
\[
\frac{dy}{dx} = \frac{-15}{3^2 \cos^2(x)}
\]
Simplify your answer completely. Your answer should be in the form \( y = f(x) \). If an arbitrary constant appears in your answer, you must enter it as an uppercase C. For example, a valid answer for the differential equation \( \frac{dy}{dx} = y \) would look like \( Ce^x \).

\( y = \) _______________

7. (1 pt)
Solve the differential equation:
\[
\frac{dy}{dx} \sec(4x) = -9
\]
Simplify your answer completely. Your answer should be in the form \( y = f(x) \). If an arbitrary constant appears in your answer, you must enter it as an uppercase C. For example, a valid answer for the differential equation \( \frac{dy}{dx} = y \) would look like \( Ce^x \).

\( y = \) _______________

8. (1 pt)
Solve the separable differential equation:
\[
\left( \csc(t) + \frac{2}{\sin(t)} \right) \frac{ds}{dt} = 32
\]
Simplify your answer completely. Your answer should be in the form \( s = f(t) \). If an arbitrary constant appears in your answer, you must enter it as an uppercase C. For example, a valid answer for the differential equation \( \frac{ds}{dt} = s \) would look like \( Ce^t \).

\( s = \) _______________

9. (1 pt)
Solve the separable differential equation:
\[
\left( \frac{w^{10}}{10^9} \right) \frac{dw}{dt} = e^{10^t}
\]
Simplify your answer completely. Your answer should be in the form \( w = f(t) \). If an arbitrary constant appears in your answer, you must enter it as an uppercase C. For example, a valid answer for the differential equation \( \frac{dw}{dt} = w \) would look like \( Ce^t \).

\( w = \) _______________
10. (1 pt)
Solve the separable differential equation:
\[
(x^{-23}) \frac{dz}{dx} + \left( \frac{1}{2x^{23}} \right) \frac{dz}{dx} = 24
\]

Simplify your answer completely. Your answer should be in the form \( z = f(x) \). If an arbitrary constant appears in your answer, you must enter it as an uppercase C. For example, a valid answer for the differential equation \( \frac{dz}{dx} = z \) would look like \( Ce^x \).

\( z = \) _______