Math 105 Quiz 4
§2.5, 2.6, 2.7
Name: Key
Show all work for credit.

$$\text{"}\tfrac{1}{2}\ln(t)\text{"}$$

1. (CAREFULLY) Differentiate $g(t) = 3sin(t) + \pi - \ln(\sqrt{t}) + e^{6t}$.

$$g'(t) = 3\cos(t) - \frac{1}{2t} + 6e^{6t}$$

2. Consider the following differential equation and IVP

   (a) Verify that $y = cos(x) + Ce^x$ solves the following differential equation

$$y'' - y + cos(x) = -cos(x)$$

$$y' = -\sin(x) + Ce^x$$
$$y'' = -\cos(x) + Ce^x$$

$$(-\cos(x) + Ce^x) - (\cos(x) + Ce^x) + \cos(x)$$
$$= -2\cos(x) + \cos(x) = -\cos(x) \checkmark$$

   (b) Find the particular solution such that y also satisfies $y(0) = 5$.

$$y(0) = \cos(0) + Ce^0 = 1 + C = 5$$
$$\text{so } C = 4$$
$$\boxed{y = \cos(x) + 4e^x}$$

3. Find the antiderivative of $f(x) = 5^x - x^2 + \frac{1}{x} - sin(x) + e^{-2x}$. (**Check your answer.**)

$$F(x) = \frac{5^x}{\ln(5)} - \frac{x^3}{3} \cdot \ln|x| + \cos(x) + \frac{e^{-2x}}{-2} + C$$

$$\text{check: } F'(x) = \frac{\cancel{\ln(5)}\,5^x}{\cancel{\ln(5)}} - x^2 + \frac{1}{x} - \sin(x) + \frac{\cancel{(-2)}\,e^{-2x}}{\cancel{-2}} \checkmark$$