AP CALCULUS AB — Homework 0324 — Name:

DR. PAUL L. BAILEY — Monday, March 24, 2025

Due Tuesday, March 26, 2025.

**Problem 1** (Thomas Problem §9.1 # 1)**.** Consider the differential equation and the function

$$2y' + 3y = e^{-x} \quad \text{and} \quad f(x) = e^{-x} + 5e^{-(3/2)x}.$$

Show that $y = f(x)$ is a solution to the differential equation.

**Problem 2** (Thomas Problem §9.1 # 3)**.** Consider the function and the differential equation

$$f(x) = \frac{1}{x}\int_1^x \frac{e^t}{t}\,dt \quad \text{and} \quad x^2y' + xy = e^x.$$

Show that $y = f(x)$ is a solution to the differential equation.

**Problem 3** (Thomas Problem §8.1 # 21)**.** Integrate )

$$\int 3^{x+1}\,dx.$$

**Problem 4** (Thomas Problem §8.1 # 77)**.** Integrate

$$\int \frac{6\,dy}{\sqrt{y}(1+y)}.$$

**Problem 5** (Thomas Problem §8.2 # 27)**.** Integrate

$$\int_0^{\pi/3} x\tan^2 x\,dx.$$

**Problem 6.** Compute $\int_1^e \dfrac{x^2+1}{x}\,dx$.

**Problem 7.** Compute $\int_0^1 \dfrac{1}{x^2+1}\,dx$.

**Problem 8** (Thomas Problem §8.2 # 33)**.** Find the volume of the solid generated by revolving the region in the first quadrant bounded by the coordinate axes, the curve $y = e^x$, and the line $x = \ln 2$, about the line $x = \ln 2$.

**Problem 9** (Thomas Problem §4.1 # 43)**.** Consider the function

$$f(x) = \frac{x}{x^2+1}.$$

Find the extreme values of the function and where they occur.

**Problem 10** (Thomas Problem §4.2 # 51)**.** The *geometric mean* of two positive real numbers $a$ and $b$ is $\sqrt{ab}$. Show that the value of $c$ in the conclusion of the Mean Value Theorem for $f(x) = \dfrac{1}{x}$ on an interval of positive numbers $[a, b]$ is $c = \sqrt{ab}$.