# MATH 396 PROBLEMS 1
# REVIEW PROBLEMS

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**Regular problems:**

**1.** Investigate the existence and convergence of the following (Lebesgue) integral:

$$\int_{-\infty}^{\infty} \frac{xdx}{(1+x^2)^2\sqrt{|x-1|}}.$$

**2.** Solve: $y'' + y' + y = x$.

**3.** Solve:$y' = \frac{y+1}{x+2} + 1$.

**4.** Can the following functions be the characteristics of a differential equation

$$y' = f(x, y)$$

where $f$ is continuous and $\frac{\partial f}{\partial y}$ exists and is continuous everywhere?

(a) $y = x + c$

(b) $y = cx + 1$.

**Challenge problem:**

**5.** Compute:

$$\int_{[0,1]^n} \max(x_1, ..., x_n) dx_1 ... dx_n.$$