Read each question carefully and be sure to SHOW ALL WORK. Correct answer without proper justification will not receive a "Complete" grade. Paç fat! Good luck!

Name: _____

LO 14. Improper Integrals. I can recognize and use limit notation to solve improper integrals.

Criteria for Success: I can

- solve improper integrals with continuity issues or where at least one of the bounds is $\pm\infty$
- identify improper integrals
- split up an improper integrals so that each of them has only one improper bound
- use appropriate limit notation and properties to solve improper integrals

Question: After a partial fraction decomposition we got $\frac{3}{x^2+1}+\frac{1}{(x-3)^2}$. Solve the following integrals related to this function by hand. To speed up the process I'm providing the solution to part (a). For improper integrals, I'm testing to see in particular appropriate limits wherever needed. **Hint:** Use (a) to do parts (b) and (c). Then, use those for part (d).

(a) $\displaystyle\int \frac{3}{x^2+1}+\frac{1}{(x-3)^2}dx = 3\arctan(x)-\frac{1}{x-3}+C$

(b) $\displaystyle\int_{-\infty}^{0} \frac{3}{x^2+1}+\frac{1}{(x-3)^2}dx =$

(c) $\displaystyle\int_{0}^{3} \frac{3}{x^2+1}+\frac{1}{(x-3)^2}dx =$

(d) $\displaystyle\int_{-\infty}^{\infty} \frac{3}{x^2+1}+\frac{1}{(x-3)^2}dx =$