

1. Does

$$\int_1^{\infty} \frac{dx}{x + x^{2007}}$$

converge?

2. Does:

$$\int_1^{\infty} \frac{dx}{(1 + x^2)(\arctan(x))^2}$$

converge? If so, evaluate.

(turn over)

3. Suppose $P(x)$ is a polynomial whose coefficients are all non-negative. Let $n \geq 2$ be an integer.

Show that

$$\int_1^{\infty} \frac{dx}{P(x) + x^n}$$

always converges.

(in class hint: for $x \geq 1$, $P(x) \geq 0$.)