

18.014–ESG Exam 3

Pramod N. Achar

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1. Compute the following derivatives:

(a) $D \left(\arctan \frac{1+x}{1-x} \right)$

(b) $D \left(\ln \sqrt{1+x^2} \right)$

2. Compute the following integrals:

(a) $\int x e^x dx$

(b) $\int \frac{2x+3}{(x-2)(x+5)} dx$

3. Compute $\lim_{x \rightarrow 0} \frac{x - \tan x}{x - \sin x}$.

4. State Taylor's Theorem. (Don't worry about all the assumptions on f , but be sure to get the statement about $E_n(x; a)$ correct.)

5. What old theorem is equivalent to the zeroth-order version of Taylor's Theorem?

6. Based on your answer to Problem 1a, what can you say about the relationship between the functions $\arctan \frac{1+x}{1-x}$ and $\arctan x$? (*Hint*: If this question seems vague or difficult, you might want to recheck your answer to Problem 1a!)

7. (Optional) What is conspicuously missing from this exam? (*Hint*: It was also missing from Problem Set 10.)