INTRODUCTION TO CALCULUS

MATH 1A

UNIT 16: WORKSHEET

The simplification problem in the exam was poorly solved which is not a surprise, as algebra is often a bottle neck. Lets look here at a few more examples.

[1]

Problem 1: Simplify the following expressions and use it to find the derivative

	Function f	Simplified f	Derivative f'
a)	$\arcsin(\sin(x^7))$		
b)	$x^7/x^{5/2}$		
c)	$\sin^2(3x) + \cos^2(3x)$		
d)	$\ln(x^{100})$		
e)	$((e^x)^x)^x$		

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[1]Illustration AI generated

Solution:
a) x^7, $7x^6$.
b) $x^{7-5/2} = x^{9/2}$, $(9/2)x^{7/2}$
c) 1, 0
d) $100\ln|x|$, $100/x$
e) e^{x^3}, $e^{x^3}3x^2$.

Problem 2: Sometimes, one can turn an indefinite form $0 \cdot \infty$ to a form which can be solved by Hospital. In the exam there was an example. Lets look at an other example. What is

$$\lim_{x\to 0} \ln|x^5| \cdot x^{1000}$$

Solution:
Write this as $5\ln|x|/x^{-1000}$ which is an indefinite form ∞/∞ and which can be brought to the hospital. We have the limit of $(5/x)/(-1000x^{-1001}) = 5x^{1000}/1000$. In the limit $x \to 0$, this gives 0.