

Sample Exam #2

Math 150–Hughes

No graphing calculators. Show all work.

1. Find the derivative of each function. (Do not simplify your answer.)

a) $f(x) = e^{2x} \sin 3x$

b) $g(x) = \operatorname{sech}^2 x$

c) $h(x) = \ln \left(\frac{x^7 2^x}{\sqrt{x^2 + 9}} \right)$

d) $p(x) = x^3 e^{-x^2}$

e) $q(x) = \frac{x + 1}{\sqrt{x^3 + 1}}$

2. Find $f''(x)$ if $f(x) = x \sin^{-1} x + \sqrt{1 - x^2}$.

3. Find the limit: $\lim_{x \rightarrow \infty} \frac{e^{2x} + 3}{3e^{2x} - e^x}$

4. Use implicit differentiation to find dy/dx if $\tan(x + y) + xy^3 = 1$.

5. Find an equation of the line tangent to the ellipse $4x^2 + y^2 = 8$ at the point $(1, -2)$.

6. Use logarithmic differentiation to find dy/dx if $y = x^{\ln x}$.

7. A table of values for f , g , f' , and g' is given:

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
1	3	-2	4	3
2	1	3	2	-5
3	-1	1	-2	8

a) Find $(f \cdot g)'(3)$.

b) Find $(f \circ g)'(3)$.

8. Let $y = \sqrt{x^2 + 9}$
- Find the differential dy .
 - Use differentials to estimate the maximum error in the calculated value of y if the value of x is found to be 4 with a possible error of 0.3.
9. Sand is being dumped from a conveyor belt at a rate of $24 \text{ ft}^3/\text{min}$ and it forms a pile in the shape of a cone whose base diameter is always equal to its height. How fast is the height of the pile increasing when the pile is 6 ft high?