

Practice for Math 150 Test 2

1. Find  $f'(x)$  (and do not simplify!) if:
  - a.  $f(x) = x^2 \cos x$
  - b.  $f(x) = \sec^3 x$
  - c.  $f(x) = (3x^5 - x)^{13}(2x^3 - 4)^{12}$
2. Find  $y'''$  if  $y = \sin(3x)$ .
3. A conical tank has height 3 m and radius 2 m at the tip. Water flows in at a rate of 2 cubic meters per minute. How fast is the water level rising when it is 2 m?
4. Find  $\frac{dy}{dx}$  using implicit differentiation:  $x^3 + \arctan y = e^y$
5. Use logarithmic differentiation to find  $\frac{dy}{dx}$  if  $y = (x^3 + 3)^{n x}$ .
6. Find  $f'(x)$  if:
  - a.  $f(x) = \sqrt{\ln x + 4x}$
  - b.  $f(x) = e^{\ln(4x-3)}$
  - c.  $f(x) = 2xe^{x^2}$
  - d.  $f(x) = x^2 \arcsin 2x$
  - e.  $f(x) = \arctan(\ln x)$
7. Verify that the hypotheses of Rolle's Theorem are satisfied by  $f(x) = \frac{x^2 - 1}{x - 2}$  on  $[-1, 1]$  and find all values of  $c$  that satisfy the conclusion of the theorem.
8. Find the absolute maximum and minimum of  $f(x) = x^3 - 6x + 1$  (if they exist) on the interval  $[-1, 1]$ .