

Midterm #2 Math 124 Autumn 2005

Name:

Student number:

1. Use logarithmic differentiation (no credit for using the quotient rule) to find  $f'(x)$  if

$$f(x) = \frac{\cos(x^2)e^{x^2-x}}{\ln(2x-3)}$$

2. Show that the ellipse

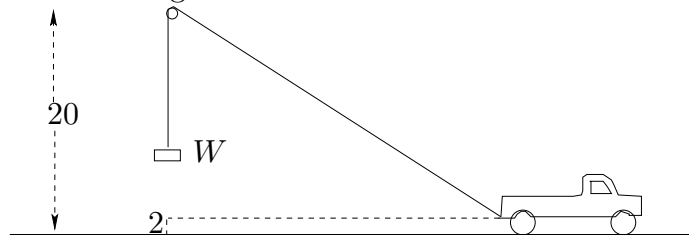
$$4x^2 + 9y^2 = 45$$

and the hyperbola

$$x^2 - 4y^2 = 5$$

meet at right angles at  $(3, 1)$ . (There are two parts to this question: show the curves meet at this point, and then show that their tangent lines are perpendicular at this point).

3. One end of a rope is attached to a weight  $W$ . The other end is attached to a truck at a point 2 ft above the ground. The rope is 50 ft long. The rope passes over a pulley 20 ft above the ground. If the truck moves off at the rate of 9 ft/sec, how fast is the weight rising when it is 6 ft above the ground?



4. Suppose that a commodity price of  $x$  dollars will result in  $y$  thousands of units sold, where  $x$  and  $y$  satisfy:

$$x + y + 2x^2y + 3xy^3 = 711,$$

For example, the point  $(6.00, 3.000)$  is on the curve, which means that 3000 items are sold at \$6.00.

Approximately how many units will be sold if the price is increased to \$6.05? (you must use calculus to receive credit for this question).