Math 124 I - Winter 2007
Mid-Term Exam Number Two
February 20, 2007

Name: _____   Section: _____

1	15	
2	15	
3	10	
4	10	
5	10	
Total	60	

- Complete all questions.

- You may use a scientific calculator during this examination; graphing calculators and other electronic devices are not allowed and should be turned off for the duration of the exam.

- If you use trial-and-error, a guess-and-check method, or numerical approximation when an exact method is available, you will not receive full credit.

- You may use one double-sided, hand-written, 8.5 by 11 inch page of notes.

- Show all work for full credit.

- You have 80 minutes to complete the exam.

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1. For each of the following, find $\dfrac{dy}{dx}$. You need not simplify your answers.

   (a) $y = 3x^6 + \sqrt{5x} - \dfrac{12}{x^3} + \cos 4x$

   (b) $y = e^{3x^5+x} \sin(2x^2 + e^x)$

   (c) $y = \dfrac{e^x(x^5 - x - 1)}{x^2 + 3}$

2. For each of the following, find $\dfrac{dy}{dx}$. You need not simplify your answers.

(a) $xy - \tan(x+y) = 2x + 3y$

(b) $y = \ln\left(\dfrac{(x+2)(x+1)}{(x-1)(x-3)}\right)$

(c) $y = x^{(x+1)(x+2)}$

3. A large piece of chocolate is melting in the hot sun. Its shape is always a cylinder, and the volume of the cylinder stays constant.

The volume of a cylinder of radius r and height h is

$$V = \pi r^2 h.$$

(a) If the height of the chocolate is 3 cm, the radius is 4 cm, and the height is changing at -1.4 cm/hr, what is the rate of change of the radius?

(b) At the instant when the height and radius of the cylinder are equal, what is the ratio of the rate of change of the height to the rate of change of the radius?

4. The figure below shows the curve

$$3xy + x^2 + y^3 = 0.$$
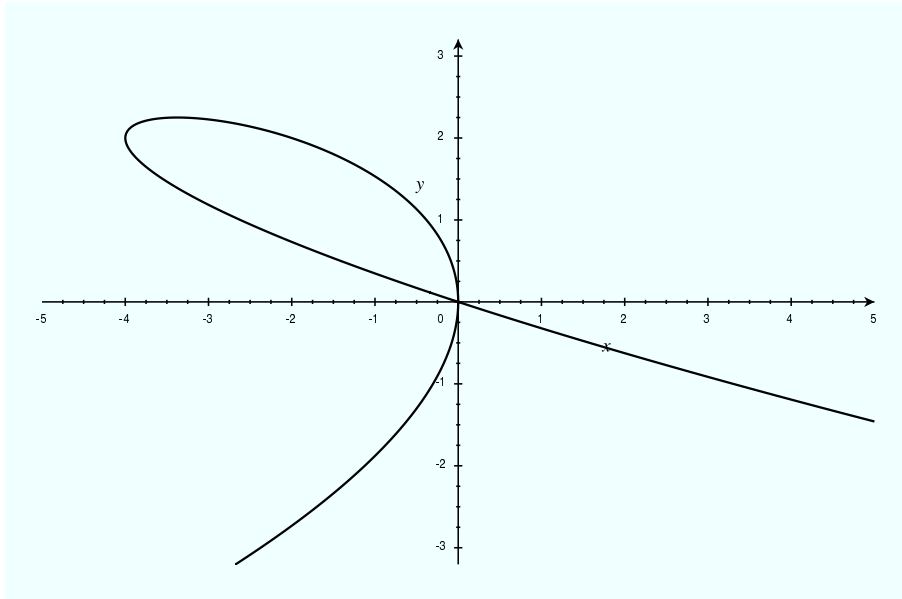
Find the coordinates of the point on the curve where the tangent line to the curve is horizontal.

5. Find the equations of the two tangent lines to the curve

$$y = \frac{1}{x}$$

that pass through the point $(3, -5)$.

(3,-5)