

**MATH 151**  
**Midterm 2, November 2, 2005**

Last Name:	
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1. DO NOT LIFT UP THE COVER PAGE UNTIL INSTRUCTED.
2. Circle your instructor. If you don't, you lose a mark.
3. This test is comprised of 8 pages.
4. Once the test begins, please check that all pages are intact.
5. Do ALL questions.
6. Clearly explain your answer. No credit will be given for just writing down the answer.
7. If the answer space provided is not sufficient, write your answer on the back of the previous page. Clearly mark the question number.
8. Ordinary Scientific Calculators ONLY are allowed.  
NO GRAPHING CALCULATORS ALLOWED.

Question	Score	Max
1		7
2		4
3		9
4		6
5		4
Total		30

1) Find the indicated derivatives of the following functions. You do *not* need to simplify your answers.

(1a) (4 marks)  $y'$  and  $y''$  where  $y = \cos(e^{2x})$

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*Answer*

$$y' =$$

$$y'' =$$

**(1b)** (3 marks)  $g'(t)$  where  $g(t) = t^{\sqrt{t \ln t}}$ ,  $t > 0$

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*Answer*

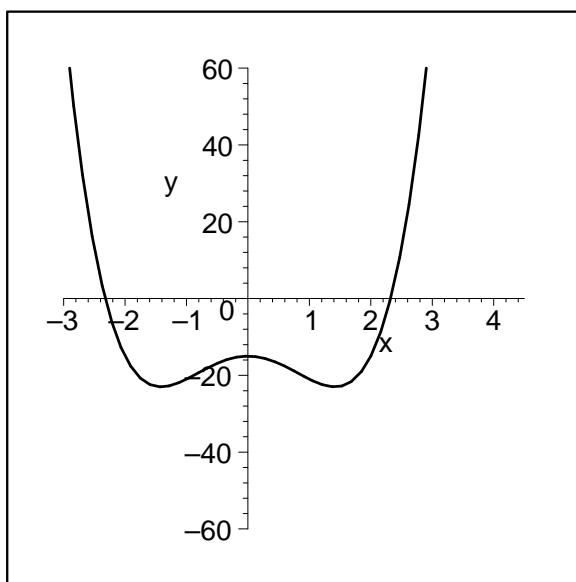
2) (4 marks) Below are the graphs of four functions. Among them are the graphs of  $f(x)$ ,  $f'(x)$  and  $f''(x)$ . Determine which of the graphs are the graphs of  $f(x)$ ,  $f'(x)$  and  $f''(x)$  and fill in the spaces below with your choice of  $a, b, c$  or  $d$ . (No explanation is required.)

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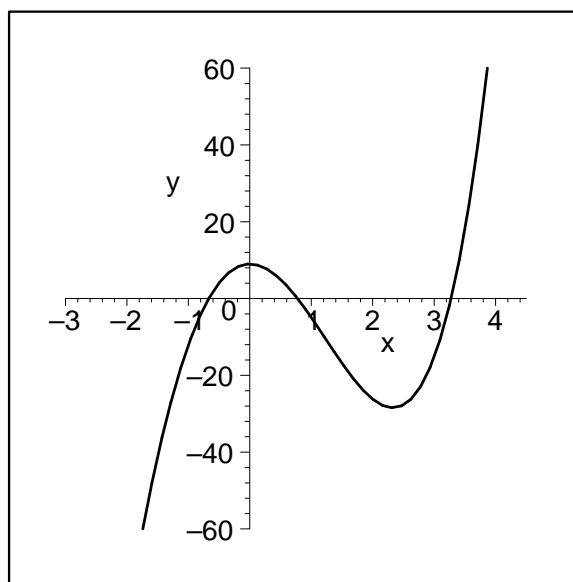
Answer

$f$  : \_\_\_\_\_  
 $f'$  : \_\_\_\_\_  
 $f''$  : \_\_\_\_\_

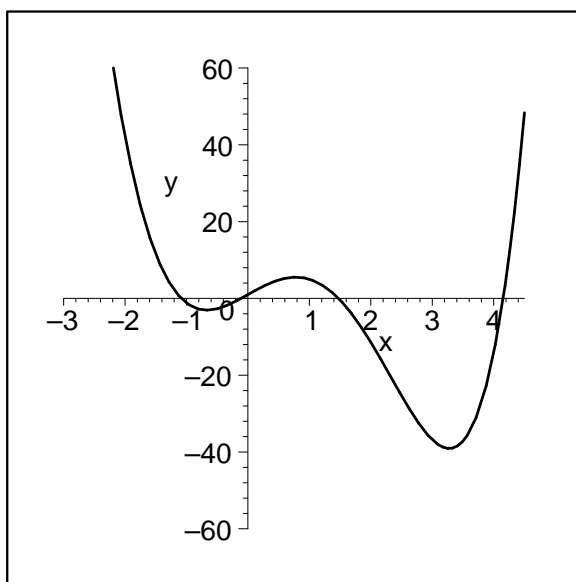
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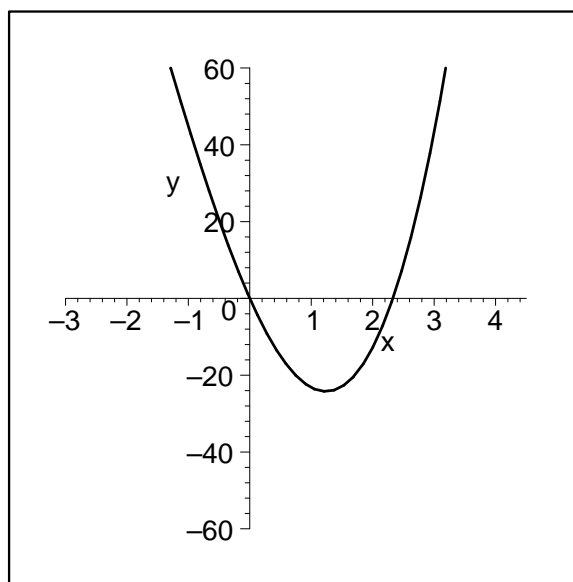
a



b



c



d

**3)** Consider the curve defined by  $x^2 + 2x + 2y^2 = xy + y$ .

**(3a)** (1 mark) Show that  $(0, 0)$  lies on the curve.

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*Answer*

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**(3b)** (2 marks) Use implicit differentiation to find  $y'$ .

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*Answer*

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**(3c)** (2 marks) Find the equation of the tangent line at a point  $(a, b)$  on the curve (your answer should contain  $a$  and  $b$ ).

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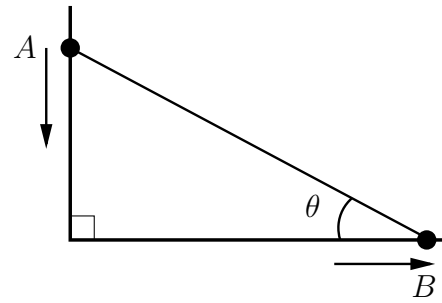
*Answer*

**(3d)** (4 marks) Find a point on the curve *different from*  $(0, 0)$  whose tangent line is parallel to the tangent line of the curve at the point  $(0, 0)$ .

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*Answer*

4) (6 marks) Two people A and B are walking along straight lines that meet at a right angle (see diagram). A approaches the intersection at 2m/s, while B moves away from the intersection at 1m/s. At what rate is the angle  $\theta$  changing when A is 10m from the intersection and B is 20m from the intersection?



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*Answer*

**5)** (4 marks) Use the linear approximation of  $f(x)$  at  $x = 9$  to estimate  $f(9.01)$  where

$$f(x) = \sqrt{x} + \frac{1}{\sqrt{x}}.$$

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*Answer*