

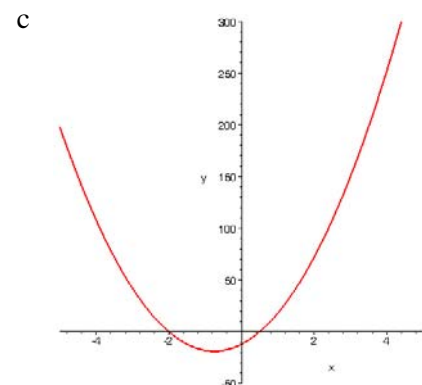
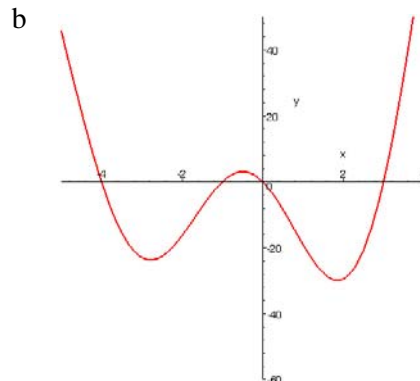
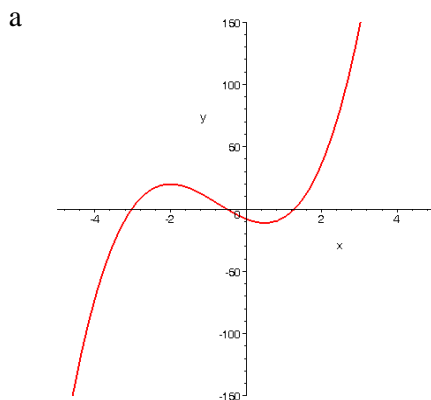
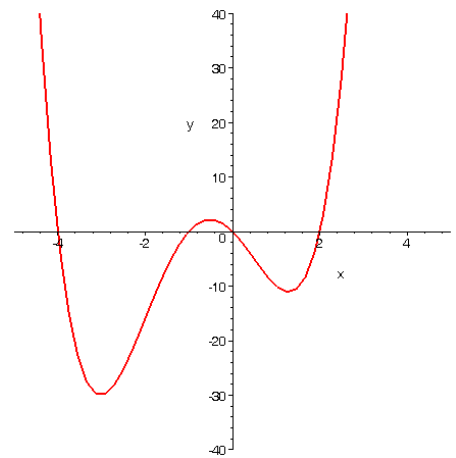
Answer the problems on **separate** paper. You do not need to rewrite the problem statements on your answer sheets. Do your own work. Show **all relevant steps** which lead to your solutions. Attach this question sheet to the front of your answer sheets.

1. (6pts) Solve (algebraically) the equation:

$$\log_{10} x + \log_{10}(x - 3) = 1$$

2. (6pts) Using the definition, find the derivative of  $f(x) = x^2 - 3x$ .

3. (4pts) The graph of  $y = f(x)$  is given in the figure to the right. Which of the figures below best represents the graph of  $y' = f'(x)$  (short answer).



4. (48pts) Using the rules of differentiation, find the first derivative of each of the following functions. Simply the results, where appropriate. Write the final form of each of the derivatives using positive exponents only.

a.  $a(x) = 12x^3 + 6\sqrt{x} + \frac{7}{x^5}$

b.  $b(x) = \frac{2x^2 + 5}{x^2 - 3x}$

c.  $c(x) = xe^{-2x} - e^{-4x}$

d.  $d(x) = \sin^{-1} x^2 - \sin 2x$

e.  $e(x) = \ln \sqrt{x^2 - 6x}$

f.  $f(x) = x^4(3x + 5)^3$

5. (8pts) Find  $y'$  for the following implicitly defined function:

.  $x^2 + 5xy - y^3 = 4x + 1$

6. (9pts) For each of the following functions, find the 10<sup>th</sup> derivative, i.e., find  $y^{(10)}$  (find  $\frac{d^{10}y}{dx^{10}}$ ):

a.  $y = \cos x$       b.  $y = e^{2x}$       c.  $y = 13x^6 + 8x^5 + 7x^4 - 9x^2 - 12x + 4$

7. (6pts) Let  $f(x) = 3x^2 - \frac{x+2}{x^2+4}$ . Find the equation of the tangent line to the graph of  $y = f(x)$  at  $x = 2$ .

8. (8pts) Let  $s(t) = 2t^2 - 10t + 2$ ,  $1 \leq t \leq 3$ , give the position of a moving body. Describe the motion of the body, i.e.,

- tell when the body is advancing
- tell when the body is retreating
- find the total distance the body travels.

9. (8pts) A truck leaves Dallas at noon and heads due north for Oklahoma City, traveling at 40 mph. A car (student driver) leaves Dallas at 1:00 pm and heads due west for Abilene, traveling at 80 mph. At 2:00 pm they are both the same distance from Dallas. At 2:00 pm, how fast is the distance between the two vehicles increasing?