More Derivative Practice

1. Given:  Write the equation in standard form for the tangent and normal lines when  .
2. If  write the equation in slope-intercept form of the normal line at 
3. Write an equation for the line tangent to the graph of  when 
4. Write an equation for the line tangent to  at  Find the *x-* and *y-* intercepts of this tangent line. Use the tangent line to approximate 
5. Write an equation for the tangent line and the normal line to  when 
6. No calculator. Given:  Find the coordinates of all relative extrema. Find the *x-*coordinates of any points of inflection. Sketch the graph.
7. No calculator. Given:  Find the coordinates of all relative maxima and minima and points of inflection. Discuss the concavity. Find the roots of the function. Sketch the graph.
8. A particle moves along the *x-*axis according to the law 
9. For what values of *t* is **s**increasing?
10. For what values of *t* is the *velocity* increasing?
11. Find the velocity when 
12. Find the acceleration when 
13. No calculator. Let 
14. Find the coordinates for all critical points.
15. Determine whether the critical points in part a) are extrema. Justify your answer.
16. Find the coordinates of all points of inflection.
17. For what values of *x* is ***f*** concave up?

 e) Sketch the graph of ***f***.

1998 AB4 (calculator active)

Let *f* be a function with  such that for all points  on the graph of *f* the slope is given by 

a) Find the slope of the graph of *f* at the point where 

b) Write an equation for the line tangent to the graph of *f* at  and use it to approximate 

c) Find *f(x)* by solving the separable differential equation  with the initial condition 

d) Use your solution from part (c) to find 

1992 AB4 (**no** calculator)

Consider the curve defined by  for 

a) Find  in terms of *y*.

b) Write an equation for each vertical tangent to the curve.

c) Find in terms of *y*.

1996 AB2 (calculator active)

Let *f* be the function given by  . As shown in the figure above, the graph of *f* crosses the *y-*axis at  and the *x*-axis at 



a) Write an equation for the line passing through the points *P* and *Q*.

b) Write an equation for the line tangent to the graph of *f* at point *Q*. Show the analysis which leads to your conclusion.

c) Find the *x*-coordinate of the point on the graph of *f*, between points *P* and *Q*, at which the line tangent to the graph of *f* is parallel to the line *PQ*.

d) Let *R* be the region in the first quadrant bounded by the graph of *f* and the segment *PQ*. Write an integral expression for the volume of the solid generated by revolving the region *R* about the *x*-axis. Do not evaluate.

1997 AB4 (calculator allowed)

Let *f* be the function given by  where *p* is an arbitrary constant.

 a) Write an expression for  and use it to find the relative maximum and minimum values of *f* in terms of *p*. Show the analysis that leads to your conclusion.

 b) For what values of *p* does *f* have three distinct roots?

 c) Find the value of *p* such that the average value of *f* over the closed interval  is 1.

1999 AB4

Suppose that the function *f* has a continuous second derivative for all *x*, and that  and  Let *g* be the function whose derivative is given by  for all *x*.

a) Write an equation for the line tangent to the graph of *f* at the point where 

b) Is there sufficient information to determine whether or not the graph of *f* has a point of inflection when  Explain your answer.

c) Given that  write the equation of the line tangent to the graph of *g* at the point where 

d) Show that  Does *g* have a local maximum at  Justify your answer.

1995 AB6

The graph of a differentiable function *f* on the closed interval [1, 7] is shown below.



Let  for 

a) Find 

b) Find 

c) On what interval or intervals is the graph of *h* concave upward? Justify your answer.

d) Find the value of *x* at which *h* has minimum on the closed interval [1, 7]. Justify your answer.

1996 AB1

The figure below shows the graph of  the derivative of *f*. The domain is the set of all real values of *x* such that 



a) For what values of *x* does *f* have a relative maximum? Why?

b) For what values of *x* does *f* have a relative minimum? Why?

c) On what intervals is the graph of *f* concave upward? Use  to justify your answer.

d) Suppose that  Draw a sketch that shows the general shape of the graph of the function *f* on the open interval 

1987 AB1 (no calculator)

A particle moves along the *x*-axis so that its acceleration at any time *t* is given by  At time  the velocity of the particle is  and its position at time  is 

a) Write an expression for the velocity of the particle, *v(t),* at any time *t.*

b) For what values of *t* is the particle at rest?

c) Write an expression for the position, *x(t)*, for the particle at any time *t*.

d) Find the total distance traveled by the particle from  to 

1989 AB3 (no calculator)

A particle moves along the *x*-axis in such a way that its acceleration at time *t* for  is given by  At time  the velocity of the particle is  and its position 

a) Write an equation for the velocity, *v(t)*, of the particle.

b) Write an equation for the position, *x(t)*, of the particle.

c) For what values of *t* is the particle at rest?

1993 AB2 (calculator)

A particle moves along the *x*-axis so that its position at any time is given by 

a) Find the acceleration of the particle at 

b) Find the velocity of the particle when its acceleration is 0.

c) Find the total distance traveled by the particle from  to 

1997 AB1 (calculator)

A particle moves along the *x*-axis so that at any time its velocity is given by  The position *x(t)* is 5 for 

a) Write a polynomial expression for the position of the particle at any time 

b) For what values of *t*,  is the particle’s instantaneous velocity the same as its average velocity on the closed interval [0, 3]?

c) Find the total distance traveled by the particle from time  until time 

1999 AB1 (calculator)

A particle moves along the y-axis with velocity given by  for 

a) In which direction (up or down) is the particle moving at time  Why?

b) Find the acceleration of the particle at time  Is the velocity of the particle increasing at  Why or Why not?

c) Given that *y(t)* is the position of the particle at time *t* and that  find 

d) Find the total distance traveled by the particle from  to 