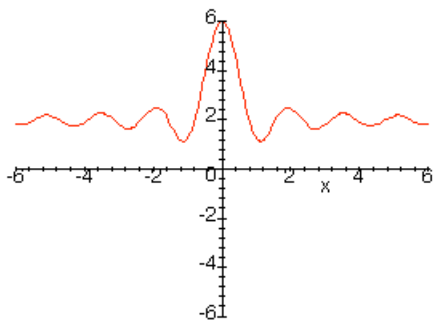
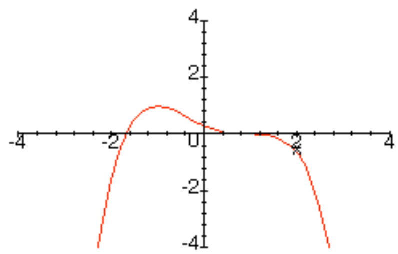
1. The graphs of the derivatives of F(x) and G(x) are given. For each statement, circle T if the statement is true, circle F if the statement is false and circle NED if there is Not Enough Data (NED) to determine whether it is true or false.

F'(x)



G'(x)



a) F(x) can be zero at most once on the interval shown. **T F NED**

b) G''(x) has no local maximum or local minimum. **T F NED**

c) G(x) is never zero on the interval shown. **T F NED**

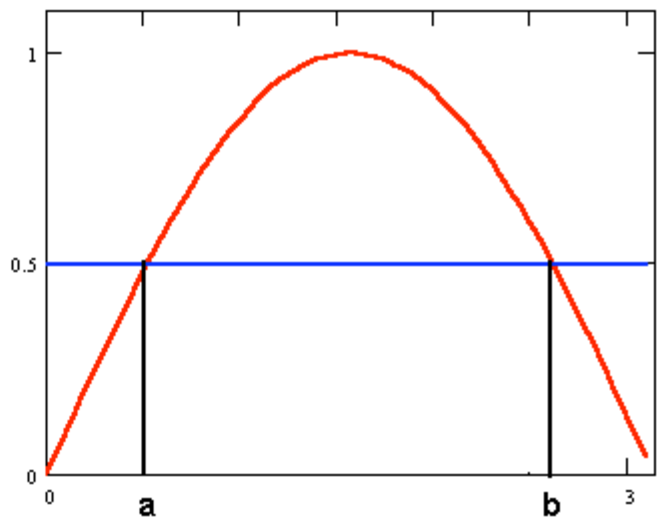
d) F''(x) is always concave up on the interval shown. **T F NED**

e) F(x) has a local maximum at x=0. **T F NED**

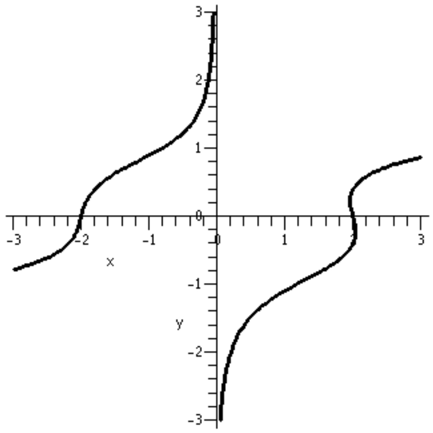
f) F'''(0) < 0. **T F NED**

g) G(2) < 0. **T F NED**

2. Find the area between the graphs of $y = \frac{1}{2}$ *and* $y = \sin x$. You must compute values for *a* and *b*.



3. Consider the curve defined by $x^2 - 3xy^3 + \sin y = 4$.



a) Find the equation of the line tangent to this curve at $(2, 0)$

b) Use your equation from part a) to approximate y when $x = 2.25$

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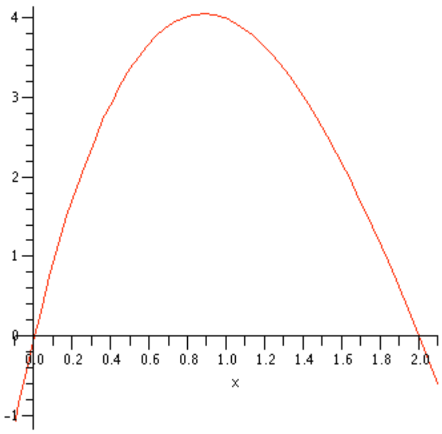
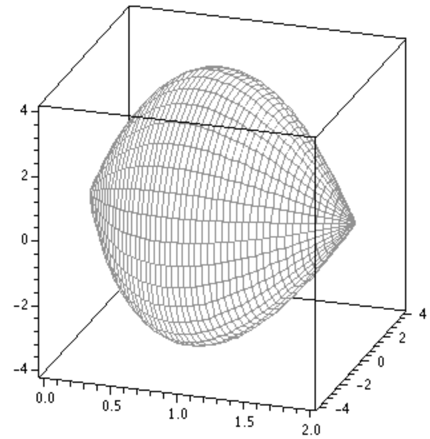
4. Find the volume of the object formed when the region bounded by y=x3-7x2+10x, x=0 and x=2 (graphs below) is rotated about the *x*-axis.



REGION



OBJECT

5. For each function, find $f'(x)$; no simplification of your answer is necessary:

$a)\ f(x) = x^3 \sin 2x$

a)

$b)\ f(x) = \dfrac{\tan x}{\sin x - x}$

b)

$c)\ f(x) = \sqrt{\dfrac{x^2+2}{x}}$

c)

6. Compute each integral:

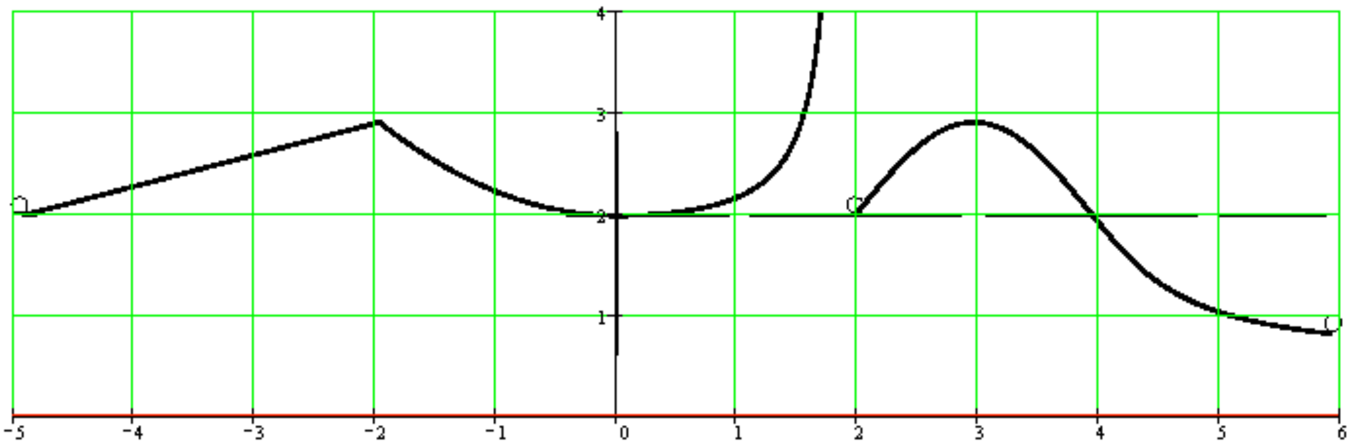
$a)\ \int x^4 - \sin x \ dx$

$b)\ \int \sec^2 5x \ dx$

$c)\ \int_0^1 x(3x^2+9)^3 \ dx$

a)
b)
c)

7. The function $y = f(x)$, graphed below, is defined for $-5 < x < 6$ *except* $x = 2$.



For what values of x in the domain of f is

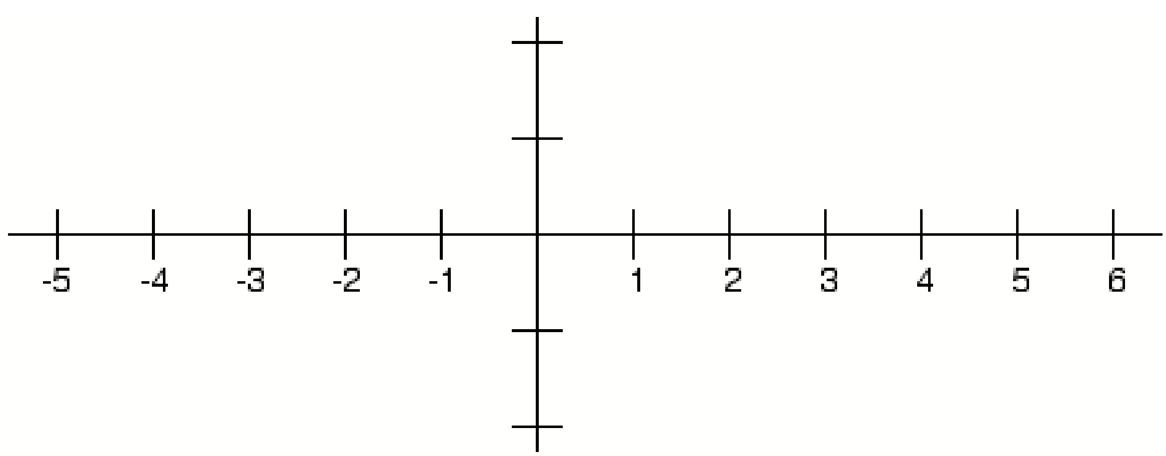
(a) $f'(x) = 0$? ______________________________

(b) $f'(x)$ positive? ______________________________

(c) $f''(x) = 0$? ______________________________

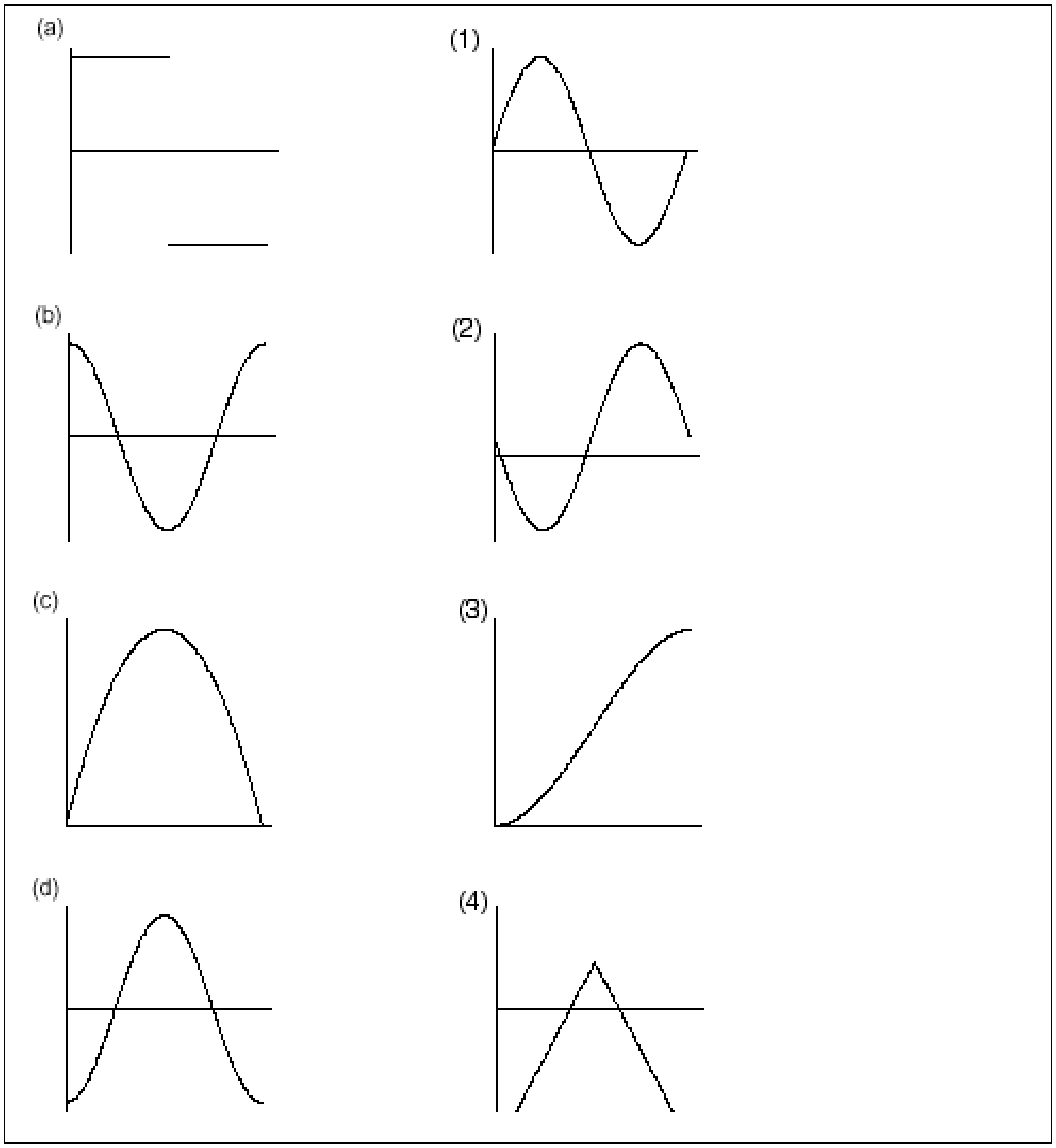
(d) $f''(x)$ negative? ______________________________

Based on your answers to the above questions, make a sketch of $y = f'(x)$ on the axes below. Make your sketch as precise as possible.



8. Match the following functions with their antiderivatives.

Function ***Antiderivative***



Function	Antiderivative
(a)	
(b)	
(c)	
(d)	

9. Use the table of values to compute:

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
0	1	0	24	-36
1	3	4	3	-9
2	9	8	0	0
3	19	12	-3	-9

a) $F(x) = f(g(x))$ $F'(1) =$ ____________________

b) $G(x) = \dfrac{f(x)}{g(x)}$ $G'(1) =$ ____________________

c) $H(x) = f(1-x)g(x^2)$ $H'(1) =$ ____________________

d) $\int_0^2 \left(f'(x)g(x) + f(x)g'(x)\right)dx$ $=$ ____________________

10. In each case, decide whether a function with the given properties can exist. Check *yes* or *no* as appropriate. If *yes*, sketch a possible graph of such a function.

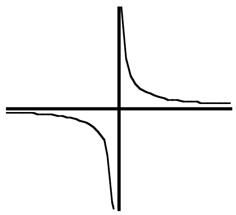
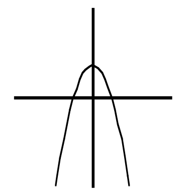
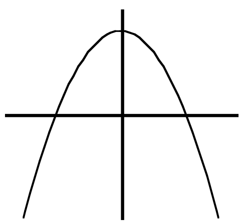
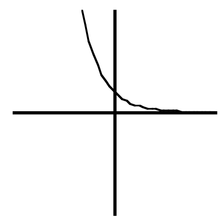
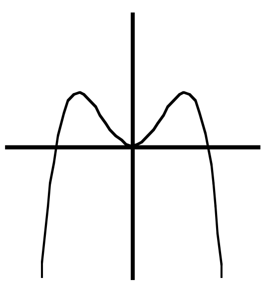
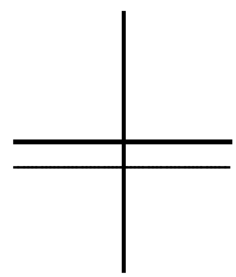
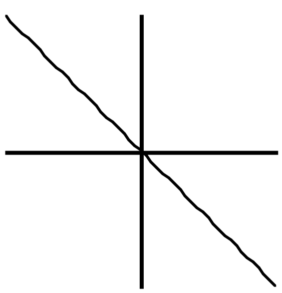
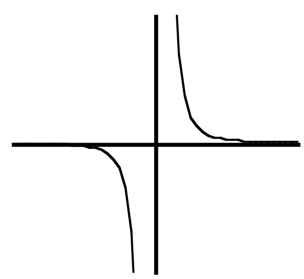
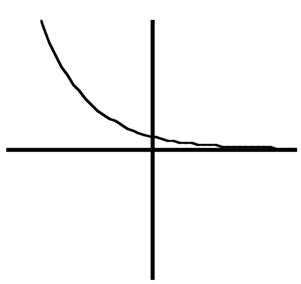
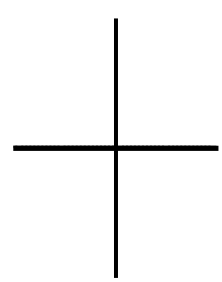
a) $f(x) < 0$ *and* $f'(x) > 0$ *for all* x ❑ yes ❑ no

b) $f(x) < 0$ *and* $f'(x) < 0$ *for all* x ❑ yes ❑ no

c) $f''(x) > 0$ *and* $f(x) < 0$ *for all* x ❑ yes ❑ no

d) $f(x) > 0,\ f'(x) > 0$ *and* $f''(x) < 0$ *for all* $x > 0$ ❑ yes ❑ no

11. Each graph in the right hand column below is the *second* derivative of one of the functions shown in the left hand column. Match the functions and their second derivatives.

 a. second derivative_____	 I)
 b. second derivative_____	 II)
 c. second derivative_____	 III)
 d. second derivative_____	 IV)
 e. second derivative_____	 V) (This is the zero function, $y = 0$)

12. If $r(t)$ represents the rate at which a country's debt is growing, then the increase in its debt between 1980 and 1990 is given by:

a) $\dfrac{r(1990)-r(1980)}{1990-1980}$ b) $r(1990)-r(1980)$ c) $\frac{1}{10}\int_{1980}^{1990} r(t)dt$

d) $\int_{1980}^{1990} r(t)dt$ e) $\frac{1}{10}\int_{1980}^{1990} r'(t)dt$ f) $r'(1990)-r'(1980)$

g) $\int_{1980}^{1990} r'(t)dt$

13. Let $f(x)=\sqrt{\sin x + x^3 + 1}$; find $f'(0)$.
a) 3 b) 0 c) 1 d) 4 e) $\frac{1}{4}$ f) 2 g) $\frac{1}{3}$ h) $\frac{1}{2}$

14. The slope of the tangent line to the curve $y = \dfrac{1-x}{1+x}$ at $(-2,\ -3)$ is:

a) -1 b) $-\frac{1}{2}$ c) $-\frac{1}{3}$ d) -2 e) -3 f) $-\frac{2}{3}$ g) $\frac{2}{3}$ h) 3

15. How many points of inflection does the function $f(x) = x^8 - x^2$ have?

a) 0 b) 1 c) 2 d) 3
e) 4 f) 5 g) 6 h) 7