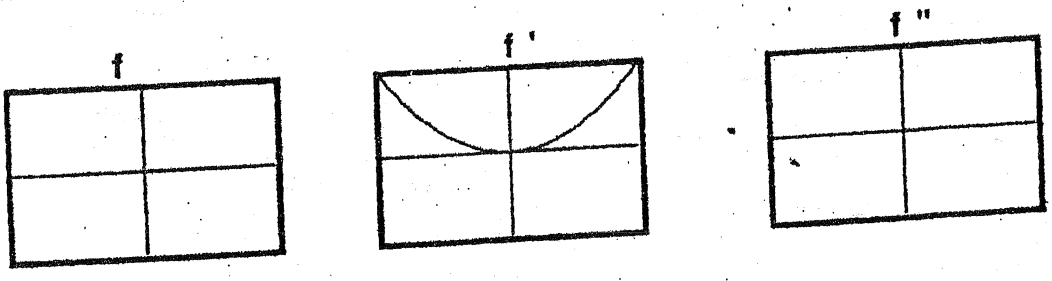
DRAWING FUNCTIONS AND DERIVATIVES OF FUNCTIONS

Sketch a graph of f and f" from the given graph of f', if possible. If not, state why this is not possible.

1.



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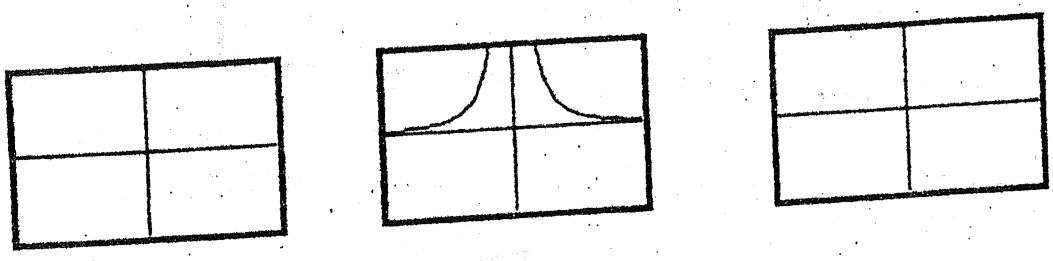

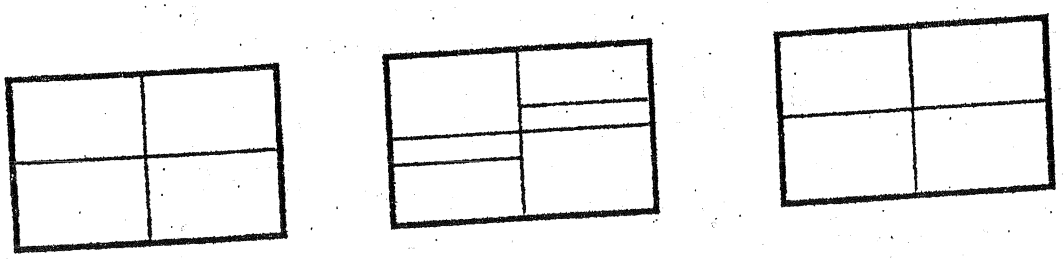

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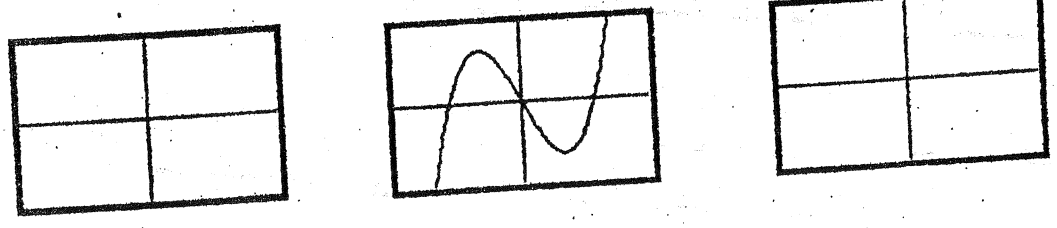

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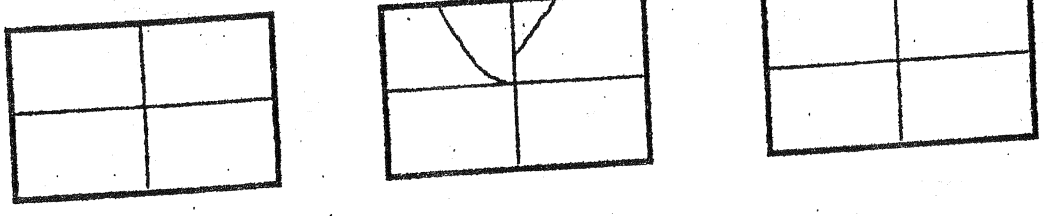
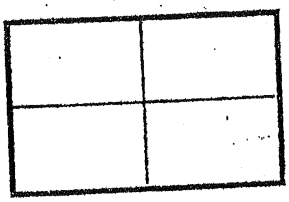
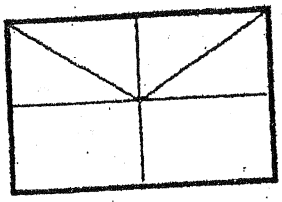
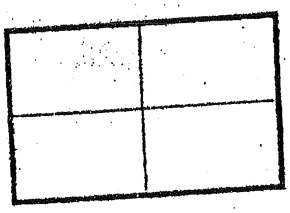


f | f ' | f "

6.







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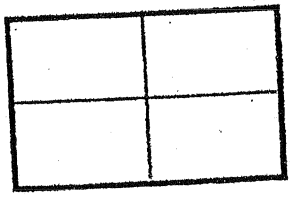

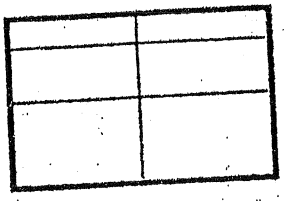

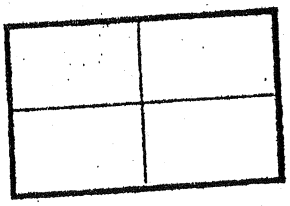

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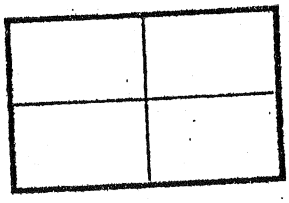
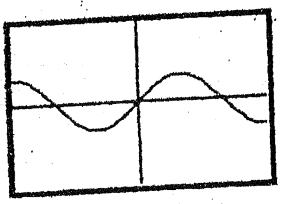
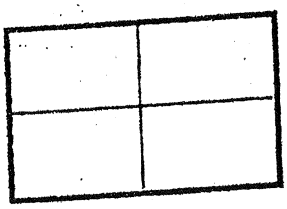




NOTE: f is periodic



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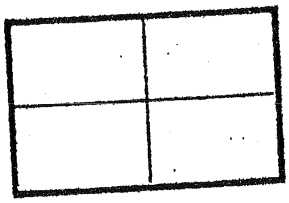

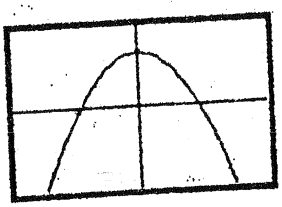

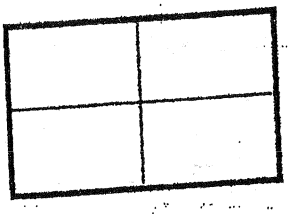

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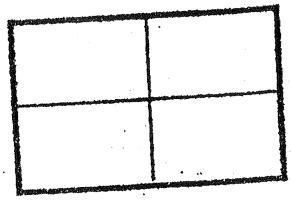
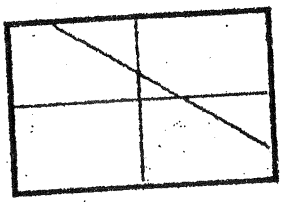
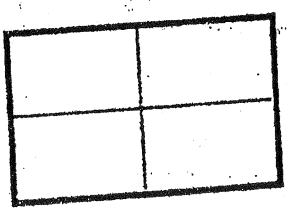






Derivatives from a table

Let f and g and their inverses be f^{-1} and g^{-1} be differentiable functions and let the values of f, g at x=1 and x=2 be given by the table below.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	3	5	2	4
2	2	6	π	7

Find the following

a. The derivative of $f+g$ at x=2
b. The derivative of fg at x=1
c. The derivative of $\frac{f}{g}$ at x=2
d. $h'(1)$ where $h(x)=f(g(x))$
e. The derivative of g^{-1} at x=2
f. The derivative of f^{-1} at x=3

Let f and g and their inverses be f^{-1} and g^{-1} be differentiable functions and let the values of f, g at x=1 and x=2 be given by the table below.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
-1	4	7	-5	2
3	-2	3	-1	π

Find the following

a. $p'(3)$ if $p(x)=f(x)g(x)$
b. $s'(-1)$ if $s(x)=f(x)+p(x)$
c. $q'(-1)$ if $q(x)=\frac{s(x)}{g(x)}$
d. $c'(3)$ if $c(x)=f(g(x))$
e. Find the slope of $g^{-1}(x)$ at x=-1
f. Find $h'(\sqrt{3})$ if $h(x)=f(x^2)$

Differentiation Practice given values but no equations!!

1. Given the following information about differentiable functions $f(x)$ and $g(x)$ at $x = 2$ and $x = 3$,

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
2	8	2	1/3	-3
3	3	-4	2π	5

determine the value of:

_____ a) $\frac{d}{dx}\{2f(x)\}$ at $x = 2$

_____ b) $\frac{d}{dx}\{f(x) + g(x)\}$ at $x = 3$

_____ c) $\frac{d}{dx}\{f(x) \cdot g(x)\}$ at $x = 3$

_____ d) $\frac{d}{dx}\left\{\frac{f(x)}{g(x)}\right\}$ at $x = 2$

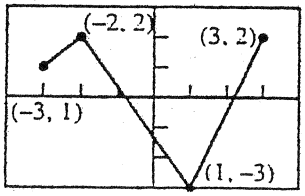
_____ e) $\frac{d}{dx}\{f(g(x))\}$ at $x = 2$

_____ f) $\frac{d}{dx}\{\sqrt{f(x)}\}$ at $x = 2$

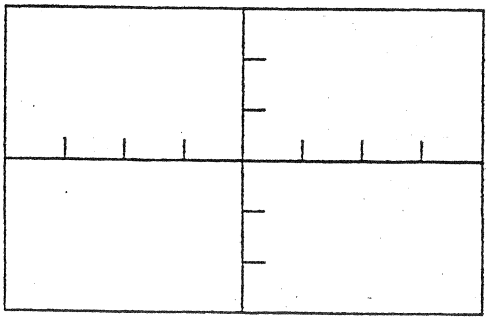
_____ g) $\frac{d}{dx}\left\{\frac{1}{g(x)}\right\}$ at $x = 3$

_____ h) If $h(x) = \sqrt{f^2(x) + g^2(x)}$, then find $h'(2)$.

2.



[−4, 4] by [−3, 3]



The graph of $f(x)$ with domain $[-3, 3]$ is composed of line segments as shown above.

(a) Sketch the graph of $f'(x)$ on the grid above.

(b) Name the x-coordinate of each point of discontinuity of $f'(x)$ over $(-3, 3)$.

Using Rules for Differentiation

Recall some of our rules for differentiation

1. $(f+g)' = f' + g'$
2. $(f-g)' = f' - g'$
3. $(f(g))' = f'(g) \cdot g'$
4. $(x^n)' = nx^{n-1}$ if $n \neq 0$
5. $(\sin x)' = \cos x$
6. $(\cos x)' = -\sin x$
7. $(e^x)' = e^x$

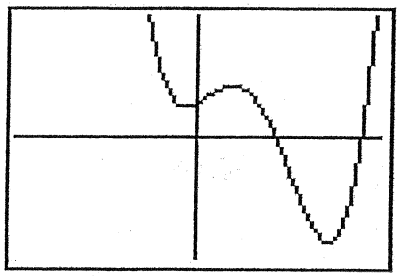
1. Complete this table, which gives practice using the Chain Rule.

$f(g)$	f	g	$f'(g)$	g'	$\frac{d}{dx} f(g) = f'(g) \cdot g'$
a. $\cos(x^3)$	cos*ine*	*cube*	$-\sin(x^3)$	$3x^2$	$=(-\sin(x^3))(3x^2)$
b. $\cos^3(x)$					
c. $\sqrt{x^2-4x}$					
d. $e^{\sin x}$					
e. $(4x^3-2x^2+1)^4$					
f. $(e^x+x^2)^3$					

2. This is the same as exercise 1, but with more pizazz!!! ☺

$f(g(h))$	f	g	h	$f'(g(h))$	$g'(h)$	h'	$\frac{d}{dx}f(g(h))$
a. $\sqrt{\cos(x^2)}$	$\sqrt{\ }$	cos	*square*	$\frac{1}{2}(\cos(x^2))^{\frac{-1}{2}}$	$-\sin(x^2)$	$2x$	$\left(\frac{1}{2}\cos(x^2)\right)^{\frac{-1}{2}}(-\sin(x^2))(2x)$
b. $(\sin(e^x))^2$							
c. $e^{\sin(x^2)}$							
d. $\sin^3(e^x)$							
e. $\sqrt{\sin(x^2-x)}$							
f. $e^{\sqrt{x^2-3x}}$							

10. The graph of the function *f*(x) is shown below.



Which of the following could be the graph of $f'(x)$. Explain.

For each graph that you did *not* select, explain why it can't be the graph of f'.

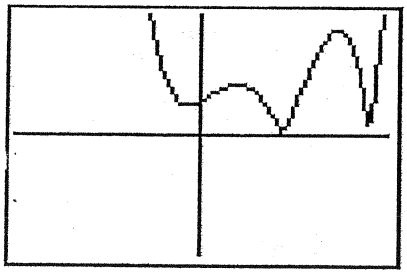


Figure 1

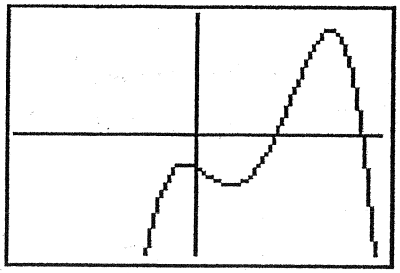


Figure 2

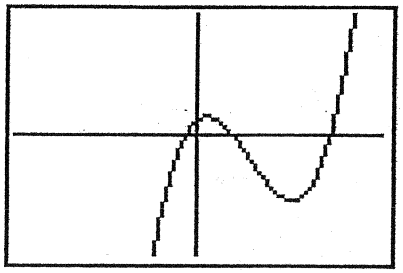


Figure 3

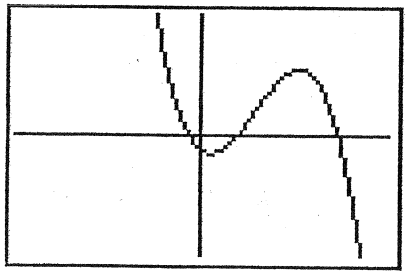


Figure 4

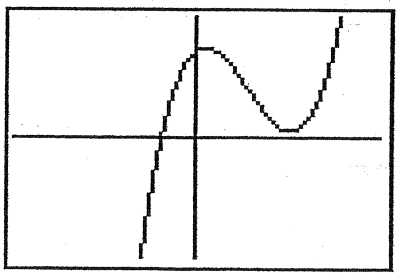


Figure 5