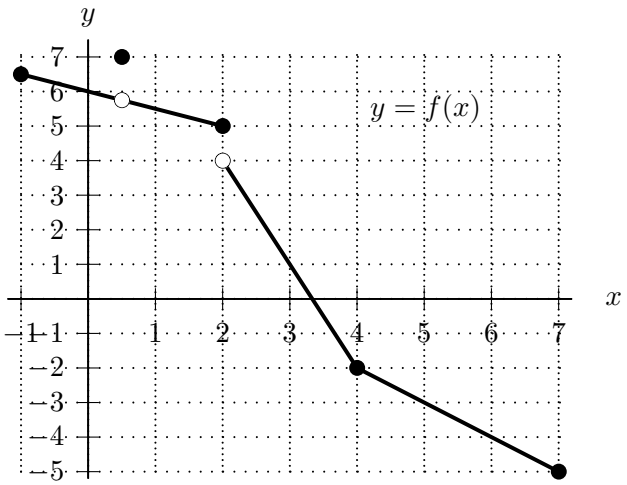
2. [11 points]

Shown to the right is the graph of a function $f(x)$.



Note that you are not required to show your work on this problem. However, limited partial credit may be awarded based on work shown.

Find each of the following values. If the value does not exist, write DOES NOT EXIST.

a. [3 points] Let $h(x) = f(3x+1)$. Find $h'(1)$.

Answer: $h'(1) =$ _____

b. [3 points] Let $k(x) = e^{f'(x)}$. Find $k'(6)$.

Answer: $k'(6) =$ _____

c. [2 points] Find $(f^{-1})'(0)$.

Answer: $(f^{-1})'(0) =$ _____

d. [3 points] Let $j(x) = \dfrac{f(2x+1)}{x+1}$. Find $j'(1)$.

Answer: $j'(1) =$ _____

8. [12 points] In the following table, both f and g are differentiable functions of x. In addition, $g(x)$ is an invertible function. Write your answers in the blanks provided. You do not need to show your work.

x	2	3	4	5
$f(x)$	7	6	2	9
$f'(x)$	-2	1	3	2
$g(x)$	1	4	7	11
$g'(x)$	1	2	3	2

a. [3 points] If $h(x) = \frac{g(x)}{f(x)}$, find $h'(4)$.

$h'(4) =$_____

b. [3 points] If $k(x) = f(x)g(x)$, find $k'(2)$.

$k'(2) =$_____

c. [3 points] If $m(x) = g^{-1}(x)$, find $m'(4)$.

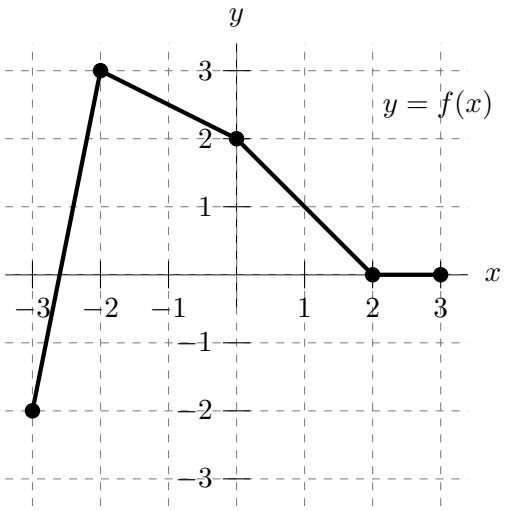
$m'(4) =$_____

d. [3 points] If $n(x) = f(g(x))$, find $n'(3)$.

$n'(3) =$_____

2. [12 points]

Let f be the piecewise linear function with graph shown below.



The table below gives several values of a differentiable function g and its derivative g'.
Assume that both $g(x)$ and $g'(x)$ are invertible.

x	-2	-1	0	2	5
$g(x)$	21	11	5	-1	-3
$g'(x)$	-12	-8	-4	-2	-0.4

You are not required to show your work on this problem. However, limited partial credit may be awarded based on work shown.

For each of parts **a.-f.** below, find the value of the given quantity. If there is not enough information provided to find the value, write "NOT ENOUGH INFO". If the value does not exist, write "DOES NOT EXIST".

a. [2 points] Let $j(x) = e^{g(x)}$. Find $j'(2)$.

Answer: _____

b. [2 points] Let $k(x) = f(x)f(x+2)$. Find $k'(-1)$.

Answer: _____

c. [2 points] Let $h(x) = 3f(x) + g(x)$. Find $h'(-2)$.

Answer: _____

d. [2 points] Find $(g^{-1})'(2)$.

Answer: _____

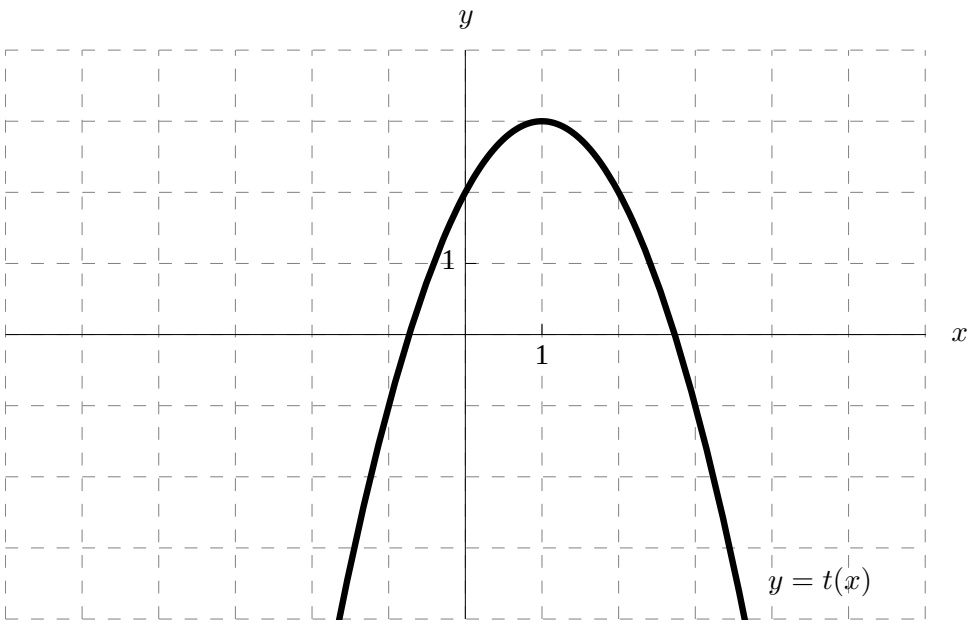
e. [2 points] Let $m(x) = g(f(g(x)))$. Find $m'(2)$.

Answer: _____

f. [2 points] Let $\ell(x) = \dfrac{f(x)}{g(2x)}$. Find $\ell'(-1)$.

Answer: _____

2. [16 points]
Graphed below is a function $t(x)$. Define $p(x) = x^2 t(x)$, $q(x) = t(\sin(x))$, $r(x) = \frac{t(x)}{3x+1}$, and $s(x) = t(t(x))$. For this problem, do not assume $t(x)$ is quadratic.



Carefully estimate the following quantities.

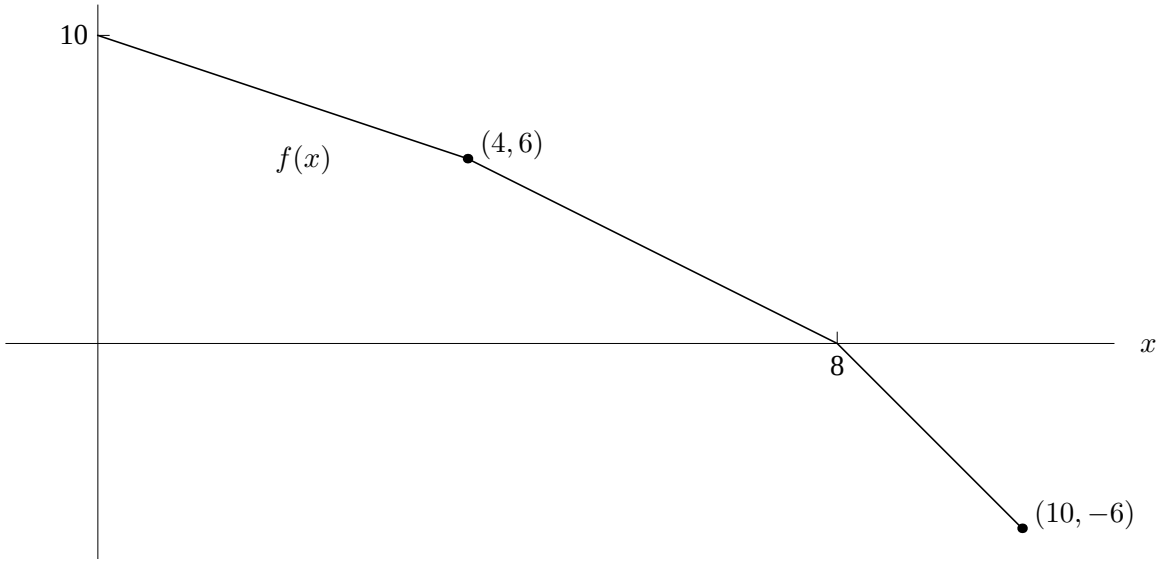
a. [4 points] $p'(-1)$

b. [4 points] $q'(0)$

c. [4 points] $r'(3)$

d. [4 points] $s'(0)$

6. [16 points] Consider the piecewise linear function $f(x)$ graphed below:



For each function $g(x)$, find the value of $g'(3)$:

a. [4 points] $g(x) = \sin\left([f(x)]^3\right)$

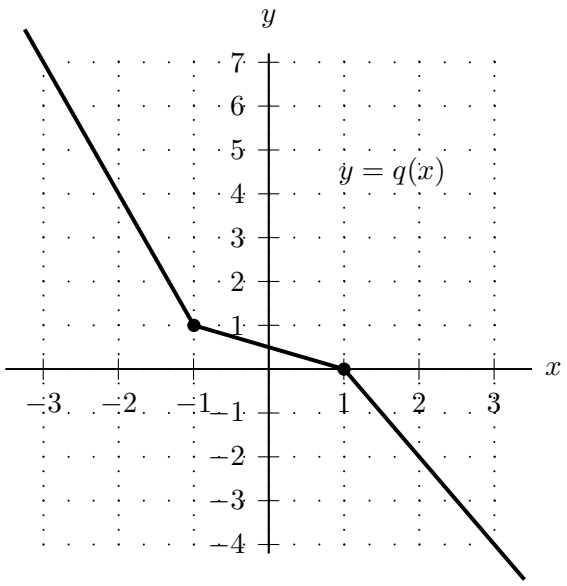
b. [4 points] $g(x) = \dfrac{f(x^2)}{x}$

c. [4 points] $g(x) = \ln(f(x)) + f(2)$

d. [4 points] $g(x) = f^{-1}(x)$

1. [11 points]

Shown to the right is the graph of an invertible piecewise linear function $q(x)$. Note that the graph passes through the points $(-3, 7)$, $(-1, 1)$, $(1, 0)$, and $(3, -4)$.



You are not required to show your work on this problem. However, limited partial credit may be awarded based on work shown.

Find the exact value of each of the quantities below. If there is not enough information provided to find the value, write "NOT ENOUGH INFO". If the value does not exist, write "DOES NOT EXIST".

a. [2 points] Let $r(x) = q^{-1}(x)$. Find $r'(2)$.

Answer: $r'(2) =$ _____

b. [3 points] Let $w(x) = \dfrac{x}{q(x+1)}$. Find $w'(-2)$.

Answer: $w'(-2) =$ _____

c. [3 points] Let $v(x) = xq(\sin x)$. Find $v'(\pi)$.

Answer: $v'(\pi) =$ _____

d. [3 points] Let $j(x) = \ln(q(2x))$. Find $j'(-1)$.

Answer: $j'(-1) =$ _____