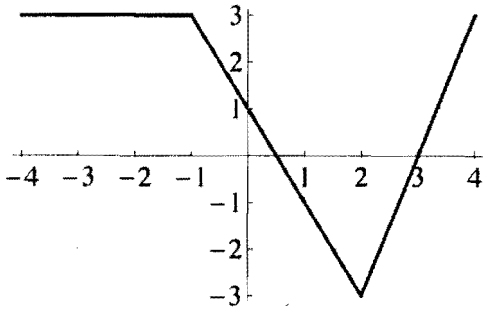


Quiz 3 (20 points in total)
 Section 201/202 (circle one)
 Name:

Key

1. [14 points] Given below is a graph of a function $f(x)$ and a table for a function $g(x)$.
 Given answers for the following or write "Does not exist". Each problem is worth 2 points.



x	-3	-2	-1	0	1	2	3
$g(x)$	-2	-3	-2	-1	1	3	2
$g'(x)$	-2	0	1	3	2	0.5	-1

a) $h(x) = \frac{g(x)}{f(x)}$. Find $h'(-3)$.

$$h'(x) = \frac{f(x)g'(x) - g(x)f'(x)}{f(x)^2} \quad h'(-3) = \frac{(3)(-2) - (-2)(0)}{3^2} = \frac{-6+0}{9} = \boxed{\frac{-2}{3}}$$

b) $k(x) = 3f(x) - g(x)$. Find $k'(2)$

$$k'(x) = 3f'(x) - g'(x) \quad k'(2) = 3f'(2) - g'(2) = 3(\text{DNE}) - 0.5 = \boxed{\text{Does Not Exist}}$$

c) $q(x) = f(x)g(x)$. Find $q'(-2)$

$$q'(x) = f'(x)g(x) + f(x)g'(x) \quad q'(-2) = f'(-2)g(-2) + f(-2)g'(-2) = 0 \cdot (-3) + (3)(0) = \boxed{0}$$

d) $a(x) = g(-f(x))$. Find $a'(1)$

$$a'(x) = g'(-f(x)) \cdot (-f'(x)) \quad a'(1) = g'(-f(1)) \cdot (-f'(1)) = g'(-(-1)) \cdot (-2) = (2)(-2) = \boxed{-4}$$

e) $l(x) = e^{2f(x)}$. Find $l'(3)$

$$l'(x) = (2f'(x)) \cdot e^{2f(x)} \quad l'(3) = (2f'(3)) \cdot e^{2f(3)} = (2)(3) \cdot e^{2 \cdot 0} = 6e^0 = \boxed{6}$$

f) $p(x) = \sin\left(\frac{\pi}{f(x)}\right)$. Find $p'(1)$

$$p'(x) = \cos\left(\frac{\pi}{f(x)}\right) \cdot \left(\frac{-\pi f'(x)}{(f(x))^2}\right) \quad p'(1) = \cos\left(\frac{\pi}{-1}\right) \cdot \left(\frac{-\pi (-2)}{(-1)^2}\right)$$

$$= \cos(-\pi) \cdot (2\pi)$$

$$= \cancel{1} \cdot 2\pi$$

$$= \cancel{1} \cdot \boxed{-2\pi}$$

First,

$$t(x) = \ln((e^{g(x)})^2) = \ln(e^{2g(x)}) = 2g(x)$$

g) $t(x) = \ln((e^{g(x)})^2)$. Find $t'(-2)$

$$t'(x) = 2g'(x)$$

$$t'(-2) = 2g'(-2) = 2(0) = 0$$

2. [6 points] "Winning the war on poverty" has been described cynically as slowing the rate at which people are slipping below the poverty line. Let N be the number of people below the poverty line at time t , answer the following questions.

(1) If N is increasing at a faster and faster rate.

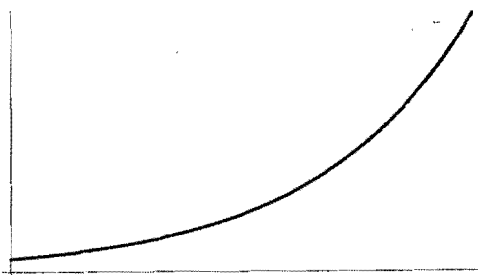
Is $N'(t)$ increasing, decreasing or neither? **Answer:** Increasing

Which is a possible graph for N ? If none is possible, write None. **Answer:** a (inc & ccv ↑)

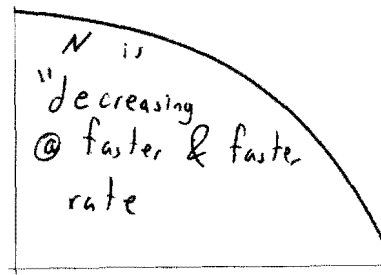
(1) If N is decreasing at a slower and slower rate.

Is $N'(t)$ increasing, decreasing or neither? **Answer:** Increasing (becoming less negative)

Which is a possible graph for N ? If none is possible, write None. **Answer:** d (dec & ccv ↑)

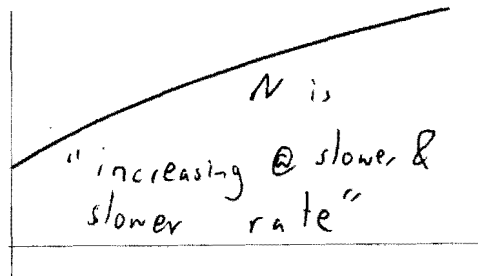


(a)



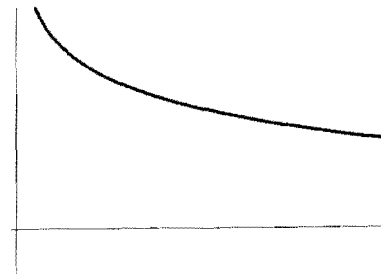
N is
"decreasing
@ faster & faster
rate"

(b)



N is
"increasing @ slower &
slower rate"

(c)



(d)