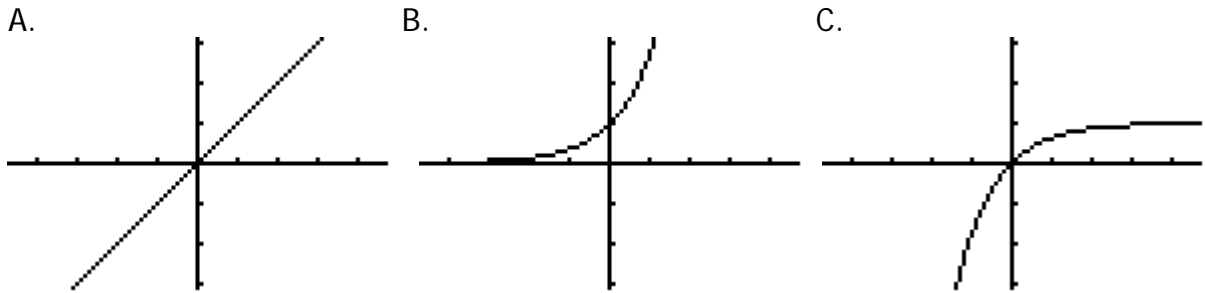


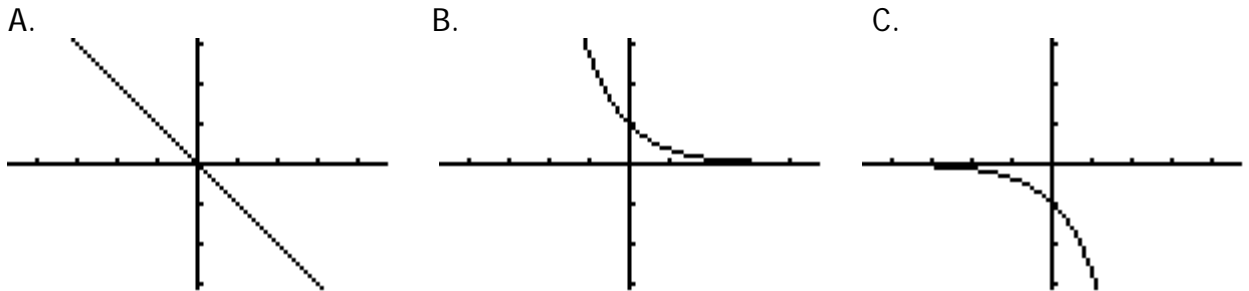
MA 181 SECTION 3.8: THE DERIVATIVE AS A RATE OF CHANGE

1. Consider the graphs of three functions. What can we say is similar about the derivatives of all of the following functions?



For which of the above functions is the second derivative function always > 0 ?

2. Consider the graphs of these three functions. What can we say is similar about the derivatives of all of the following functions?



For which of the above functions is the second derivative always < 0 ?

3. When $v(t) > 0$ and $a(t) > 0$, is the object speeding up or slowing down?
4. When $v(t) > 0$ and $a(t) < 0$, will the object be speeding up or slowing down?
5. When $v(t) < 0$ and $a(t) > 0$, will the object be speeding up or slowing down?
6. When $v(t) < 0$ and $a(t) < 0$, will the object be speeding up or slowing down?

7. A particle moves according to the position function $f(t) = \frac{1}{3}t^3 - t^2 - 4t$, where t is measured in seconds and f in feet.
- A. What is the position of the particle
- i. at $t = 1$?
 - ii. at $t = 3$?
 - iii. at $t = 5$?
 - iv. at $t = 6$?
- B. Find the velocity at time t . That is find $f'(t)$.
- C. What is the velocity at
- i. $t = 1$?
 - ii. $t = 3$?
 - iii. $t = 4$?
- D. When is the particle at rest?
- E. When is the particle moving forward?
- F. Find the total distance traveled by the particle on the interval $[0,2]$.

- G. Find the total distance traveled by the particle on the interval $[2, 4]$.
- H. Which of F & G is larger? Why?
- I. Find the acceleration of the particle at time t . that is find $f''(t)$.
- J. When is the particle speeding up?
- K. When is the particle slowing down?

8. The function $C(t) = K(e^{-at} - e^{-bt})$ where a , b , and K are positive constants and $b > a$, is used to model the concentration at time t of a drug injected into the bloodstream.

A. Find $\lim_{t \rightarrow \infty} C(t)$

B. Find a formula for the rate at which the drug is cleared from the circulation.

C. When is this rate equal to 0?

D. Suppose $a = 2$, $b = 3$, and $k = 100$. Find the rate at which the drug is cleared from circulation at time $t = 1$, $t = 2$.

E. For which of these times is the drug being cleared more quickly?