

Vs A Vs B

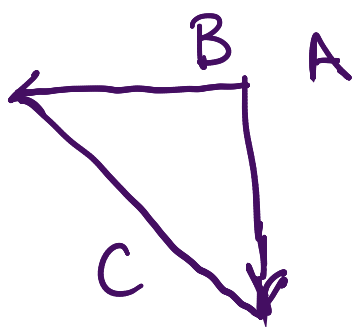
1	C	B
2	B	C
3	A	B
4	B	A
5	A	A
6	E	B
7	B	E
8	E	E
9	D	C
10	C	D
11	D	D
12	D	B
13	B	D

Section # \_\_\_\_\_ Name \_\_\_\_\_

UF ID # \_\_\_\_\_ Signature \_\_\_\_\_

**YOU MUST SHOW ALL WORK TO RECEIVE FULL CREDIT.**

1. Two people start moving from the same point. Person A travels south at 3 m/s and Person B travels west at 4 m/s. At what rate is the distance between the two people increasing two seconds later?



$$\frac{dA}{dt} = 3$$

$$\frac{dB}{dt} = 4$$

$$\frac{dC}{dt} = ?$$

distance = rate · time

$$A = 3 \cdot (2) = 6$$

$$B = 4 \cdot 2 = 8$$

$$6^2 + 8^2 = C^2$$

$$36 + 64 = C^2 = 100$$

$$C = 10$$

$$A^2 + B^2 = C^2$$

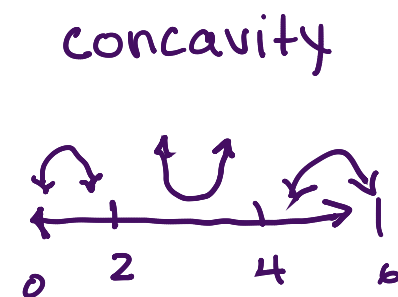
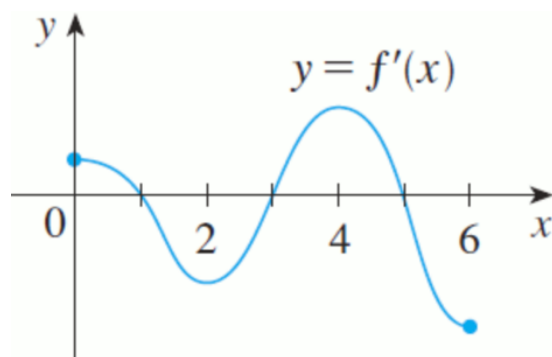
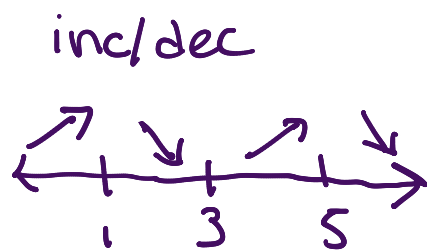
$$2A \frac{dA}{dt} + 2B \frac{dB}{dt} = 2C \frac{dC}{dt}$$

$$2 \cdot 6 \cdot 3 + 2 \cdot 8 \cdot 4 = 2 \cdot 10 \frac{dC}{dt}$$

$$36 + 64 = 20 \frac{dC}{dt}$$

$$\frac{100}{20} = \frac{dC}{dt} = 5$$

2. The graph of the **derivative**,  $f'(x)$ , of  $f(x)$  is shown below. Answer the following questions.



- (a) On what interval is  $f$  increasing?

$$(0, 1) \cup (3, 5)$$

- (b) On what interval is  $f$  decreasing?

$$(1, 3) \cup (4, 6)$$

- (c) List the critical points of  $f$

$$x = 1, 3, 5$$

- (d) At what value(s) of  $x$  does  $f$  have a local max?

$$x = 1, 5$$

- (e) At what value(s) of  $x$  does  $f$  have a local min?

$$x = 3$$

- (f) On what interval is  $f$  concave up?

$$(2, 4)$$

- (g) On what interval is  $f$  concave down?

$$(0, 2) \cup (4, 6)$$

- (h) What value(s) of  $x$  does  $f$  have a point of inflection?

$$x = 2, 4$$

3. Consider the function  $y = f(x)$  where

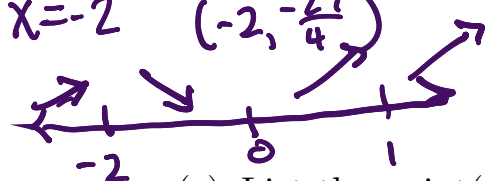
$$f(x) = \frac{(x-1)^3}{x^2} \quad f'(x) = \frac{(x-1)^2(x+2)}{x^3} \quad f''(x) = \frac{6(x-1)}{x^4}$$

(a) What is the domain of  $f$ ? What are the vertical and horizontal asymptotes of  $f$ ?

domain  $(-\infty, 0) \cup (0, \infty)$  no horizontal asymptote  
vertical asymptote  $x=0$

(b) List the critical point(s) of  $f$ . On what interval is  $f$  increasing? decreasing?

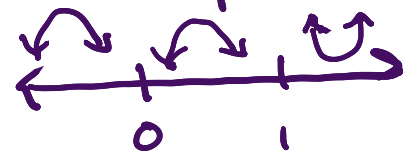
critical points  $x=-2$   $(-2, -\frac{27}{4})$   
increasing  $(-\infty, -2) \cup (0, 1) \cup (1, \infty)$   
decreasing  $(2, 0)$



A number line with tick marks at -2, 0, and 1. Arrows above the line indicate intervals: increasing on  $(-\infty, -2)$ , decreasing on  $(-2, 0)$ , increasing on  $(0, 1)$ , decreasing on  $(1, \infty)$ .

(c) List the point(s) of inflection. On what interval is  $f$  concave up? concave down?

inflection point  $x=1$   $(1, 0)$  concave up  $(1, \infty)$   
concave down  $(-\infty, 0) \cup (0, 1)$



A number line with tick marks at 0 and 1. Curved arrows above the line indicate concavity: concave down on  $(-\infty, 0)$ , concave up on  $(0, 1)$ , and concave down on  $(1, \infty)$ .

(d) At what point(s) does  $f$  have a local maximum? local minimum?

local max  $(-2, -\frac{27}{4})$   
no local min

(e) Sketch the graph of  $f$ .

