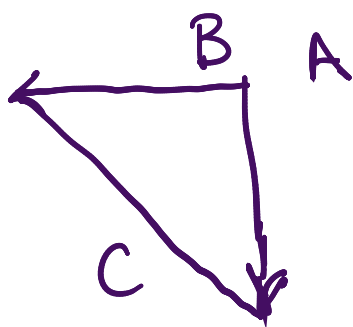


Section # _____ Name _____

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

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

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

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

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

$$C = 10$$

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

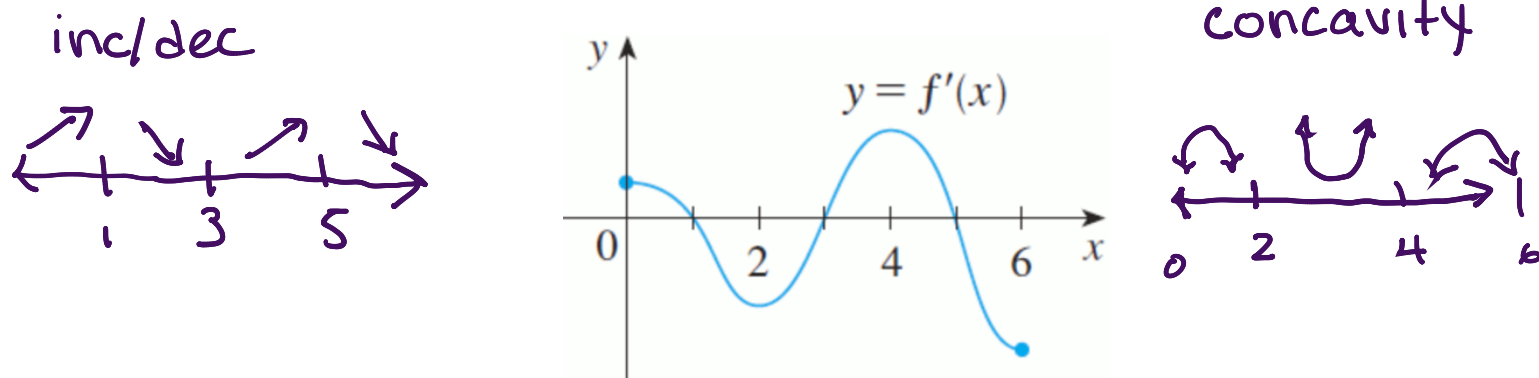
$$2A \frac{dA}{dt} + 2B \frac{dB}{dt} = 2C \frac{dC}{dt}$$

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

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

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

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

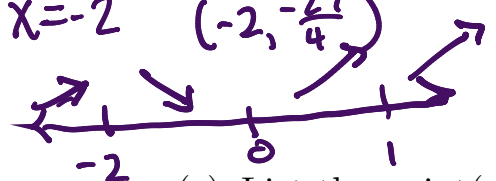
$$f(x) = \frac{(x-1)^3}{x^2} \quad f'(x) = \frac{(x-1)^2(x+2)}{x^3} \quad f''(x) = \frac{6(x-1)}{x^4}$$

- (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 $x=0$

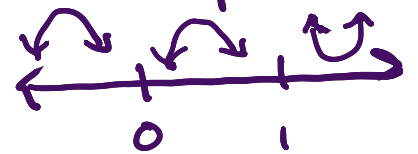
- (b) List the critical point(s) of f . On what interval is f increasing? decreasing?

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



- (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 $(-\infty, 0) \cup (0, 1)$



- (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 .

