

$$x^2 - 9x^2 - 21x + 4 = f(x)$$

Find roots of f if possible.

This doesn't look easy.

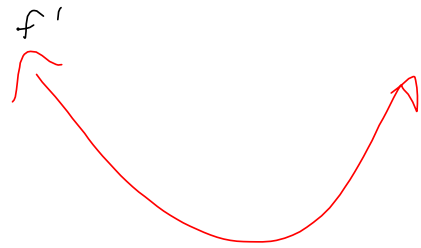
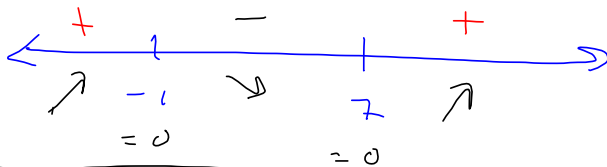
MAT 121 skills would say $\pm 1, \pm 2, \pm 4$ are possibilities. ugh! Looks hard.

So let's answer §3.3 #5 video question

(a) Inc & Dec. All about f'

$$f'(x) = 3x^2 - 18x - 21 = 3(x^2 - 6x - 7)$$

$$= 3(x-7)(x+1) \quad \text{critical: } x = -1, 7$$



Inc: $(-\infty, -1) \cup (7, \infty)$
Dec: $(-1, 7)$

(b) Local max (a) $x = -1$
 $\rightarrow (-1, 15) = A \text{ MAX}$

Local min (a) $x = 7$
 $\rightarrow (7, -241) \text{ MIN} = B$

$$\begin{array}{r} -1 \mid 1 \quad -9 \quad -21 \quad 4 \\ \quad \quad -1 \quad 10 \quad 1 \\ \hline 1 \quad -10 \quad -11 \quad 15 = f(-1) \end{array}$$

$$\begin{array}{r} 7 \mid 1 \quad -9 \quad -21 \quad 4 \\ \quad \quad 7 \quad -14 \quad -245 \\ \hline 1 \quad -2 \quad -35 \quad -241 \end{array}$$

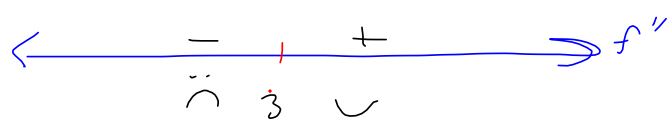
(c) Inflection:

$$f''(x) = 6x - 18 \stackrel{\text{set}}{=} 0 \Rightarrow x = 3$$

$\rightarrow (3, -113) = C \text{ INF}$

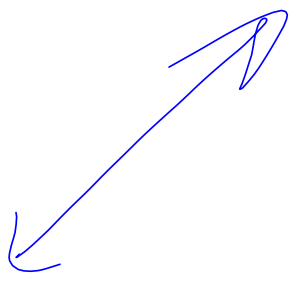
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$$\begin{array}{r} 3 \mid 1 \quad -9 \quad -21 \quad 4 \\ \quad \quad 3 \quad -18 \quad -117 \\ \hline 1 \quad -6 \quad -39 \quad -113 \end{array}$$



c-down: $(-\infty, 3)$

c-up: $(3, \infty)$

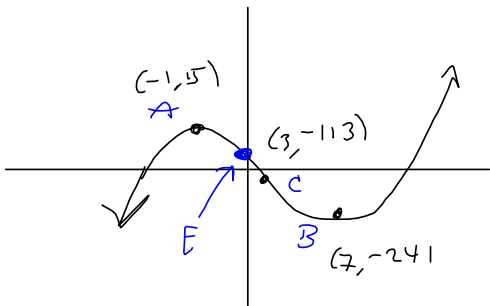
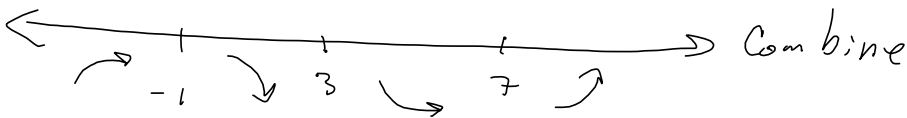
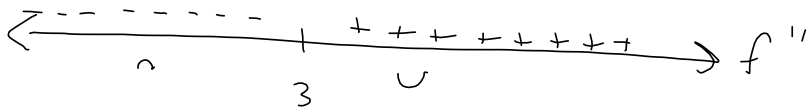
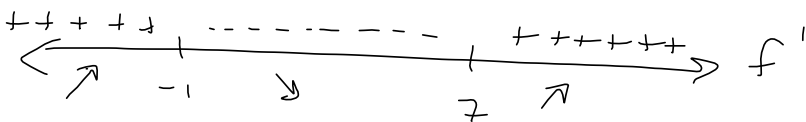


Graphing $x^3 - 9x^2 - 21x + 4$

$f'(x) = 3x^2 - 18x - 21 \stackrel{\text{SET}}{=} 0 \Rightarrow$

$x = -1, 7$ critical

$f''(x) = 6x - 18 \stackrel{\text{SET}}{=} 0 \Rightarrow x = 3$ INF.



$f(0) = 4$

$E = (0, 4)$

x-intercepts?

Digital is only quickway.

#14 in Book Video #6
 $8\cos^2 x - 16\sin x = f(x)$

$$= 8(1 - \sin^2 x) - 16\sin x$$

$$= 8 - 8\sin^2 x - 16\sin x$$

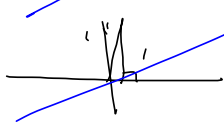
ALEX, AGAIN.

$$= -8\sin^2 x - 16\sin x + 8$$

$$= -8[\sin^2 x + 2\sin x - 1]$$

$$= -8[\sin^2 x - 1]^2 \quad \text{SET} = 0$$

$$\sin x = 1$$



$$\begin{aligned} \sin^2 x + 2\sin x - 1 & \\ u^2 + 2u - 1 & \text{SET} = 0 \\ u^2 + 2u & = 1 \end{aligned}$$



$$\begin{aligned} u^2 + 2u + 1 & = 1 + 1 \\ (u+1)^2 & = 2 \end{aligned}$$

$$u+1 = \pm\sqrt{2}$$

$$u = -1 \pm \sqrt{2}$$

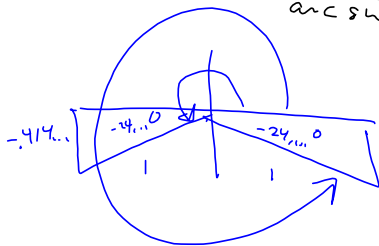
$$\sin x = -1 \pm \sqrt{2}$$

$\swarrow -1 - \sqrt{2}$ is impossible
 $\searrow -1 + \sqrt{2} \approx -0.414213562$

$$\sin x = -.414213562$$

$$\Rightarrow x =$$

$$\arcsin(-.414213562) \approx -24.46980050^\circ$$



$$180^\circ - 24.47^\circ \approx 204.4698005^\circ$$

$$360^\circ - 24.47^\circ \approx 335.5301995^\circ$$

