8 pts.

HW 16 3.5 #2, 4, 7, 9

3.5 #2 (1) $y' > 0$ = $(-\infty, \text{around } -1) \cup (\text{around } 1, +\infty)$

$y' < 0$ = $(-1, 1)$

graph 1

(2) $y'' < 0$ = $(-\infty, -1)$

$y'' > 0$ = $(1, +\infty)$

$y'' < 0$ = $(-1, 0)$

$y'' > 0$ = $(0, 1)$

graph 3.

#4 characteristic A: exclude C & D

Now we are left w/ choices A, B.

characteristic D: exclude B, coz $\frac{1}{7-x^2} - 1 = 0$

$\Rightarrow \frac{1}{7-x^2} = 1$

has roots. ($x^2 = 6$)

A

#7 i) $f'(x) = (x-7)^2 + x \cdot 2(x-7)$.

$= x^2 - 14x + 49 + 2x^2 - 14x$

$= 3x^2 - 28x + 49$

OR

$(x-7)(x-7+2x) = 0$

$\Rightarrow (x-7)(3x-7) = 0$

$f'(x) = 0 \Rightarrow (x-7)(3x-7) = 0 \Rightarrow x_1 = 7,\ x_2 = \frac{7}{3}$

ii) $f'(x) > 0 \Rightarrow x > 7$ or $x < \frac{7}{3}$

$f'(x) < 0 \Rightarrow \frac{7}{3} < x < 7$

I: $(-\infty, \frac{7}{3})$, $(7, +\infty)$

D: $(\frac{7}{3}, 7)$

#9 i) $f'(x) = \dfrac{3x^2(x^2-9) - x^3 \cdot 2x}{(x^2-9)^2}$

$= \dfrac{x^4 - 27x^2}{(x^2-9)^2}$

$f''(x) = \dfrac{(4x^3 - 54x)(x^2-9)^2 - (x^4 - 27x^2)2(x^2-9) \cdot 2x}{(x^2-9)^4}$

$$= \frac{2x(2x^2-27)(x^2-9)^2 - 4x^3(x^2-9)(x^2-27)}{(x^2-9)^4}$$

$$f''(x)=0 \Rightarrow 2x(x^2-9)\left[(2x^2-27)(x^2-9) - 2x^2(x^2-27)\right]=0$$

$$\Rightarrow 2x(x^2-9)(9x^2+243)=0$$

$$\Rightarrow x=0, \pm 3.$$

(2) $f''(x)>0 \Rightarrow x>3$ or $-3<x<0$

$f''(x)<0 \Rightarrow x<-3$ or $0<x<3$

Concave up: $(-3,0)$, $(3,+\infty)$

Concave down: $(-\infty,-3)$, $(0,3)$

Inflection pts $x=0,-3,3$