

$$31] f(x) = x^4 - 24x^2$$

$$f'(x) = 4x^3 - 48x$$

$$f''(x) = 12x^2 - 48 = 12(x^2 - 4) = 12(x+2)(x-2)$$

$$f''(x) = 0 \text{ at } x = -2, 2$$

Intervals	$(x+)$	$(x-)$		
$(-\infty, -2)$	-	-	= +	Concave up
$(-2, 2)$	+	-	= -	" down
$(2, \infty)$	+	+	= +	" up

$$f(-2) = 16 - 96 = -80$$

$$f(2) = 16 - 96 = -80$$

Inflection points are  
 $(-2, -80)$  and  $(2, -80)$

$$63] f(x) = (x^2 - 4)^2 \quad f(x) = 0 \text{ at } x = -2, 2$$

$$f'(x) = 2(x^2 - 4) \cdot 2x = 4x(x^2 - 4) = 4x^3 - 16x$$

$$f'(x) = 0 \text{ at } x = -2, 0, 2 \quad f(0) = 16$$

$$f''(x) = 12x^2 - 16 = 12\left(x^2 - \frac{4}{3}\right)$$

$$f''(x) = 0 \text{ at } x = -\frac{2}{\sqrt{3}}, \frac{2}{\sqrt{3}}$$

Sign Cl

$$f\left(-\frac{2}{\sqrt{3}}\right) = f\left(\frac{2}{\sqrt{3}}\right) = \left(\frac{4}{3} - 4\right)^2 = \left(-\frac{8}{3}\right)^2 = \frac{64}{9}$$

63 cont.]

# Siga Chart

$$\frac{64}{9} \approx 7.11$$

$$\frac{2}{\sqrt{3}} \approx 1.15$$

$x$	-2	$-\frac{2}{\sqrt{3}}$	0	$\frac{2}{\sqrt{3}}$	2
$f'(x)$	0	$64/9$	16	$64/9$	0
$f''(x)$	---	0	+	0	---
$f'''(x)$	+	+	+	0	+
	Min		Max		Min

$$f'(x) = 4x(x^2 - 4)$$

$$f''(x) = 12(x^2 - \frac{4}{3})$$

$$x < -4 \quad - \quad + \quad = \quad -$$

$$x < -\frac{2}{\sqrt{3}} \quad + \quad = \quad +$$

$$-4 < x < 0 \quad - \quad - \quad = \quad +$$

$$-\frac{2}{\sqrt{3}} < x < \frac{2}{\sqrt{3}} \quad - \quad = \quad -$$

$$0 < x < 4 \quad + \quad - \quad = \quad -$$

$$x > \frac{2}{\sqrt{3}} \quad + \quad = \quad +$$

$$x > 4 \quad + \quad + \quad = \quad +$$

