

On your own paper work out the first and second derivatives.

$f(x) = (4-x^2)^5$	$f' = -10x(4-x^2)^4$	$f'' = 10(4-x^2)^3(9x^2-4)$
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Using  $f(x)$ :

- a. Find the x-intercept(s) of the function. (2,0) (-2,0)
- b. Find the y-intercept(s) of the function. (0,1024)
- c. List any vertical or horizontal asymptotes. none

Using  $f'(x)$ :

- d. Find the intervals over which  $f$  is increasing or decreasing. Justify your answer.  
 $f'(x) = 0$   
 $-10x(4-x^2)^4 = 0$   
 $x = 0 \quad x = \pm 2$   

$f(x)$	+	+	-	-
	-2	0	2	

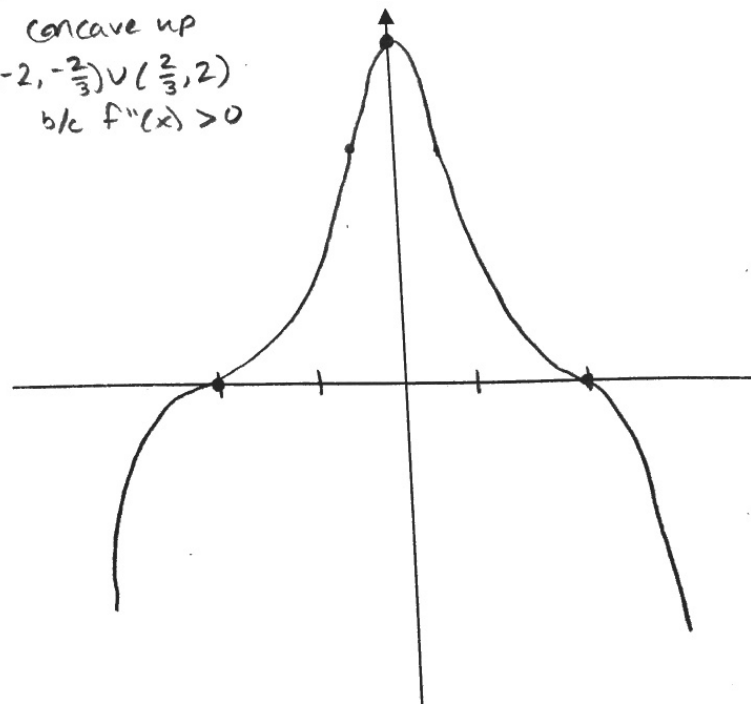
inc  $(-\infty, -2) \cup (-2, 0)$  or  $(-\infty, 0)$   
 b/c  $f'(x) > 0$   
 dec  $(0, 2) \cup (2, \infty)$  or  $(0, \infty)$   
 b/c  $f'(x) < 0$
- e. Identify the coordinates of any maximum and minimum points.  
 max of 1024 at  $x = 0$

Using  $f''(x)$ :

- f. Determine the open intervals where  $f$  is concave upward or concave downward. Justify your answer.  
 $f''(x) = 0$   
 $10(4-x^2)^3(9x^2-4) = 0$   
 $x = \pm 2 \quad x = \pm \frac{2}{3}$   

$f''(x)$	-	+	-	+	-
	-2	$\frac{2}{3}$	$\frac{2}{3}$	2	

concave down  $(-\infty, -2) \cup (-\frac{2}{3}, \frac{2}{3}) \cup (2, \infty)$   
 b/c  $f''(x) < 0$   
 concave up  $(-\frac{2}{3}, -2) \cup (\frac{2}{3}, 2)$   
 b/c  $f''(x) > 0$
- g. Identify the coordinates of any points of inflection.  
 POT:  $(\frac{2}{3}, 568.247)$   
 $(-2, 0) \quad (2, 0)$   
 $(-\frac{2}{3}, 568.247)$
- h. Sketch the graph of  $f(x)$ .



On your own paper work out the first and second derivatives.

$f(x) = \frac{x}{x^2 - 9}$	$f' = \frac{-x^2 - 9}{(x^2 - 9)^2}$	$f'' = \frac{2x(x^2 + 27)}{(x^2 - 9)^3}$
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Using  $f(x)$ :

- Find the x-intercept(s) of the function. (0,0)
- Find the y-intercept(s) of the function. (0,0)
- List any vertical or horizontal asymptotes. HA:  $y=0$  VA:  $x=3, x=-3$

Using  $f'(x)$ :

- Find the intervals over which  $f$  is increasing or decreasing. Justify your answer.

$$f'(x) = 0$$

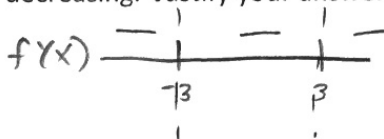
$$-x^2 - 9 = 0$$

$$-x^2 = 9 \text{ none}$$

$$f'(x) \text{ DNE}$$

$$x^2 - 9 = 0$$

$$x^2 = 9 \quad x = \pm 3$$



dec  $(-\infty, -3) \cup (-3, 3) \cup (3, \infty)$   
 b/c  $f'(x) < 0$

- Identify the coordinates of any maximum and minimum points.

none

Using  $f''(x)$ :

- Determine the open intervals where  $f$  is concave upward or concave downward. Justify your answer.

$$f''(x) = 0$$

$$2x(x^2 + 27) = 0$$

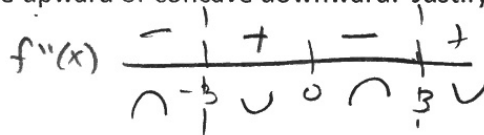
$$2x = 0 \quad x^2 + 27 = 0$$

$$x = 0 \quad \text{none}$$

$$f''(x) \text{ DNE}$$

$$(x^2 - 9)^3 = 0$$

$$x = \pm 3$$



- Identify the coordinates of any points of inflection.

(0,0)

- Sketch the graph of  $f(x)$ .

