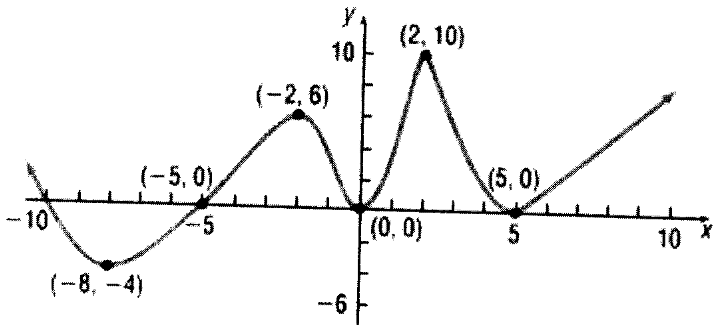
For #s 11-20:



15. List the interval(s) on which f is increasing. $(-8,-2), (0,2), (5,\infty)$

16. List the interval(s) on which f is decreasing. $(-\infty,-8), (-2,0), (2,5)$

19. List the numbers at which f has a local maximum. What are these local maxima?

Max of 6 @ $x=-2$, max of 10 @ $x=2$

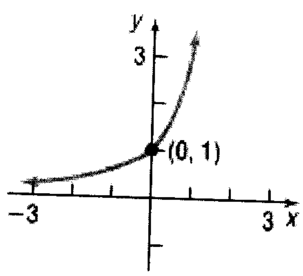
20. List the numbers at which f has a local minimum. What are these local minima?

min of -4 @ $x=-8$, min of 0 at $x=0$, min of 0 @ $x=5$

In Problems 21–28, the graph of a function is given. Use the graph to find:

(a) *The intercepts, if any*
(b) *The domain and range*
(c) *The intervals on which it is increasing, decreasing, or constant*
(d) *Whether it is even, odd, or neither*

23.



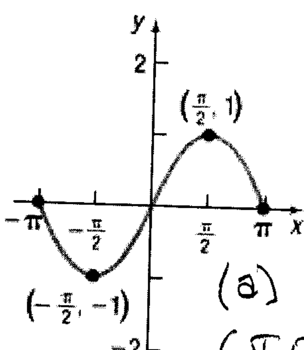
(a) x-int: None
y-int: $(0,1)$

(b) $\mathcal{D} = \mathbb{R}$, $\mathcal{R} = (0,\infty)$

(c) Increasing: $\mathbb{R}$

(d) Neither

25.



(a) x-int: $(-\pi,0), (0,0), (\pi,0)$
y-int: $(0,0)$

(b) $\mathcal{D} = [-\pi,\pi]$, $\mathcal{R} = [-1,1]$

(c) Increase: $(-\frac{\pi}{2}, \frac{\pi}{2})$
Decrease: $(-\pi,-\frac{\pi}{2}), (\frac{\pi}{2}, \pi)$

(d) ODD

In Problems 33–44, determine algebraically whether each function is even, odd, or neither.

43. $h(x) = \dfrac{-x^3}{3x^2 - 9}$

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

$\boxed{\text{ODD}}$

59. $g(x) = x^2 - 2$

(a) Find the average rate of change from -2 to x.

(b) Use the result of part (a) to find the average rate of change of g from -2 to 1. Interpret this result.

(a) $$\frac{f(x) - f(-2)}{x - (-2)} = \frac{x^2 - 2 - ((-2)^2 - 2)}{x + 2}$$

$$= \frac{x^2 - 2 - (4 - 2)}{x + 2}$$

$$= \frac{x^2 - 2 - 2}{x + 2}$$

$$= \frac{x^2 - 4}{x + 2}$$

$$= \frac{(x - 2)(x + 2)}{x + 2}$$

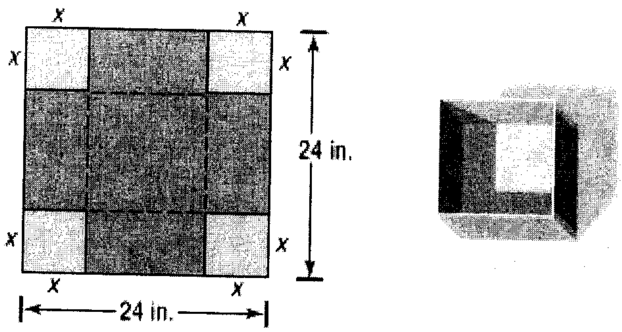
$$= x - 2 \quad (x \neq -2)$$

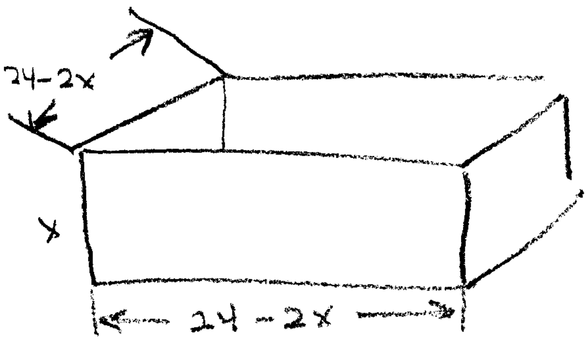
b) from -2 to 1:

$$\frac{f(1) - f(-2)}{x - (-2)} = 1 - 2 = \boxed{-1}$$

by (a)

63. Constructing an Open Box An open box with a square base is to be made from a square piece of cardboard 24 inches on a side by cutting out a square from each corner and turning up the sides (see the figure).





(a) Express the volume V of the box as a function of the length x of the side of the square cut from each corner.

(b) What is the volume if a 3-inch square is cut out?

(c) What is the volume if a 10-inch square is cut out?

* (d) Graph $V = V(x)$. For what value of x is V largest?

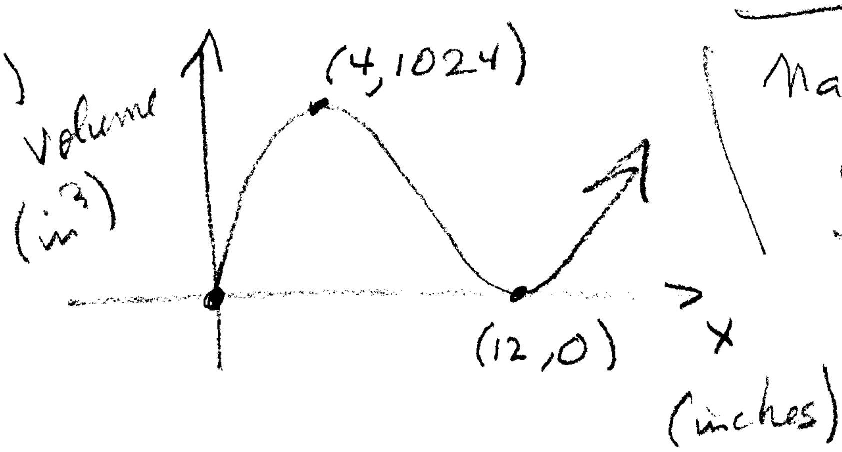
(a) $V = (24-2x)(24-2x)x = (\text{length})(\text{width})(\text{height})$

$= V(x) = (24-2x)^2 x$

(b) $V(3) = (24-6)^2(3) = (18)^2(3) = (324)(3) = 972 \text{ in}^2$

(c) $V(10) = (24-20)^2(10) = (4^2)(10) = 160 \text{ in}^2$

(d)



Max of 1024 in^3 @ $x = 4$