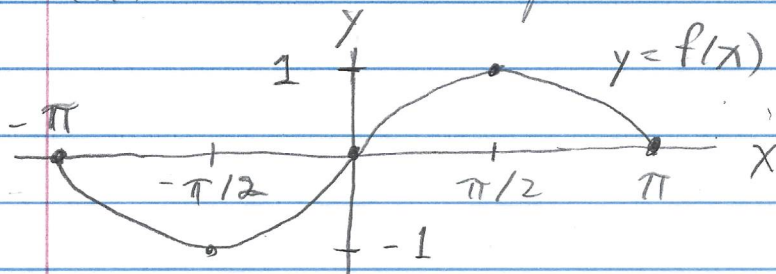


Exercise 2.3.29 Use the graph below to find
 (a) the intercepts, if any, (b) the domain and range, (c) the intervals on which the function is increasing, decreasing, or constant, (d) whether the function is even, odd, or neither.



Solution

(a) The points on the axes are $(-\pi, 0)$, $(0, 0)$, and $(\pi, 0)$. \square So the x -intercepts are $(-\pi, 0)$, $(0, 0)$, and $(\pi, 0)$; the y -intercept is $(0, 0)$.

(b) The domain is the set of x -values where f is defined, so the domain is $[-\pi, \pi]$.

The range is the set of $y = f(x)$ values, so the range is $[-1, 1]$.

(c) A function is increasing when it is going "uphill" (as read from left to right) then \square f is increasing on $(-\pi/2, \pi/2)$. A function is decreasing when it is going "downhill" (as read from left to right), so \square f is decreasing on $(-\pi, -\pi/2) \cup (\pi/2, \pi)$.

2.3.29
continued

(d) Since f is not symmetric with respect to the y -axis (for example, there are not points in Quadrant II corresponding to the points in Quadrant I), f is not an even function (by Theorem 2.3.A).

Now f is symmetric with respect to the origin, so f is an odd function (by Theorem 2.3.A).

□