

Lesson #2

Aim: What is the relationship between functions and graphs?

Do Now

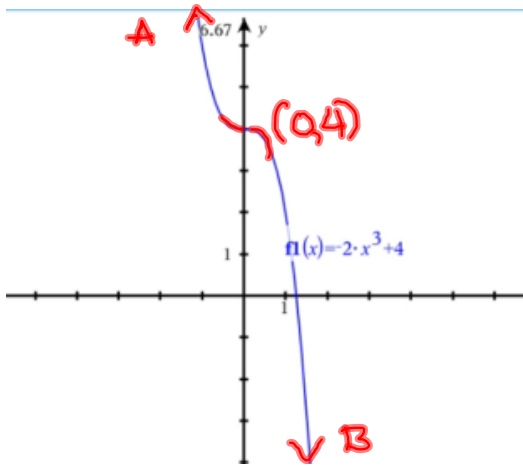
①  $y = -2x^3 + 4$

(a) leading coefficient

- ← cubic polynomial function
- ← y-intercept = (0,4)
- ← odd exponent
- ← at least 2 turning points (degree -1)
- ← END BEHAVIOR (up/down)

Read from left to right.

Ⓐ. 150 72ab



72. The table below shows the 2002 federal income tax rates for a single person.  $(x)$

	Taxable income	Tax equation
1	not over \$6000	10% of income
2	over \$6000, but not over \$27,950	\$600 + 15% of amount over \$6000
3	over \$27,950, but not over \$67,700	\$3892.50 + 27% of amount over \$27,950
4	over \$67,700, but not over \$141,250	\$14,625 + 30% of amount over \$67,700
5	over \$141,250, but not over \$307,050	\$36,690 + 35% of amount over \$141,250
6	over \$307,050	\$94,720 + 38.6% of amount over \$307,050

- a. Write a piecewise-defined function  $T$  such that  $T(x)$  is the tax due on a taxable income of  $x$  dollars. What is the domain of the function?
- b. Find  $T(24,000)$ ,  $T(35,000)$ , and  $T(100,000)$ .

Piece-wise function

a)  $T(x)$  { equation condition  
 $0.10x$  ,  $0 < x \leq 6000$   
 $600 + 0.15(x - 6000)$   $6000 < x \leq 27,950$

a. domain of function  $x \geq 0$

10%  $0 < x \leq 6000$

$600 + 15\%(x - 6000)$   $6000 < x \leq 27950$  ✓

$3892.50 + 27\%(x - 27950)$   $27950 < x \leq 67700$

$14625 + 30\%(x - 67700)$   $67700 < x \leq 141250$

$36690 + 35\%(x - 141250)$   $141250 < x \leq 307050$

$94720 + 38.6\%(x - 307050)$   $307050 < x$

$T(24000)$   $\approx$   $6000 < 24000 < 27950$

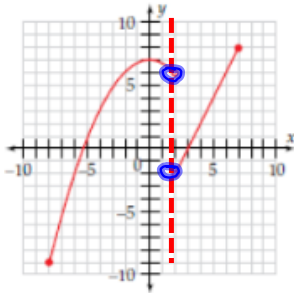
~~600 +~~  $600 + 15\%(24000 - 6000) = 3300$  ✓

$T(35000)$   $3892.50 + 27\%(35000 - 27950) = 5796$

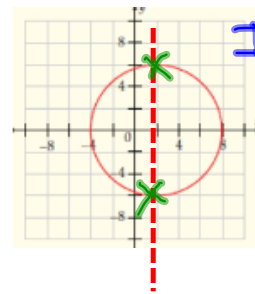
I - A function Defined by a graph

1) Check if it's a function - vertical line test

GRAPH-1



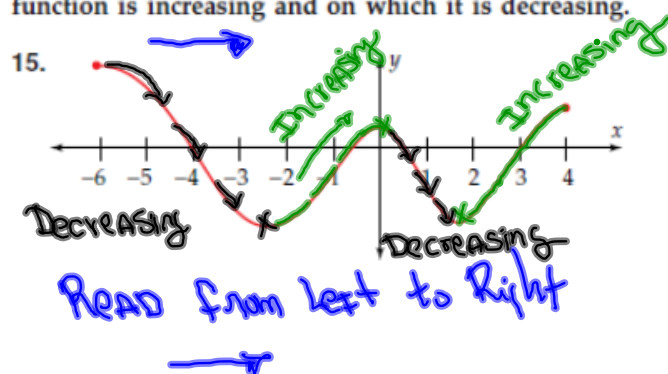
It's a function  
piece-wise



It's not  
a function

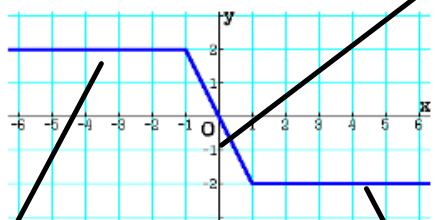
page 160:2,4,5,7,9,11,13

In Exercises 15 and 16, the graph of a function is shown. Find the approximate intervals on which the function is increasing and on which it is decreasing.



In Exercises 17–22, graph each function. Find the approximate intervals on which the function is increasing, decreasing, and constant.

17.  $f(x) = |x - 1| - |x + 1|$



Decreasing

Read from left to Right.



constant  
(no change)

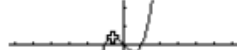
constant

In Exercises 23–28, graph each function. Estimate all local maxima and minima of the function.

23.  $f(x) = x^3 - x$

24.  $g(t) = -\sqrt{16 - t^2}$

$Y1=X^3-X$



X=0.5713502101 Y=0.3849001795

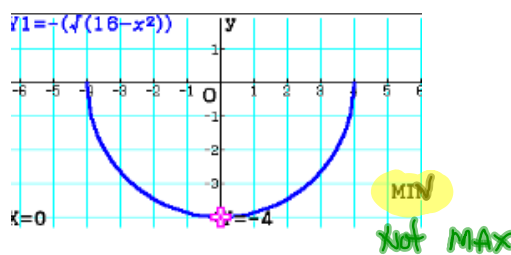
MAX

$Y1=X^3-X$



X=0.5713502101 Y=-0.3849001795

MIN



In Exercises 33–36, graph each function. Find the approximate intervals on which the function is concave up and concave down, and estimate all inflection points.

33.  $f(x) = x^3$

34.  $f(x) = x^3 - 2x$

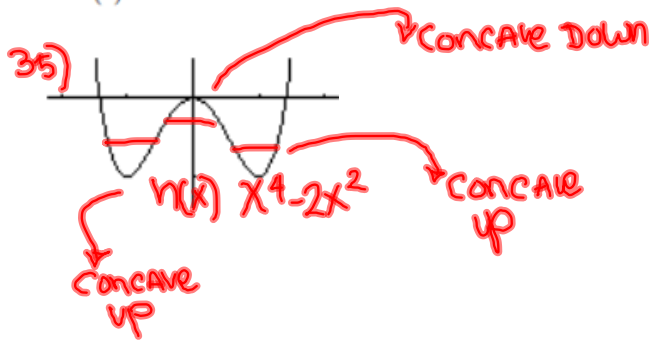
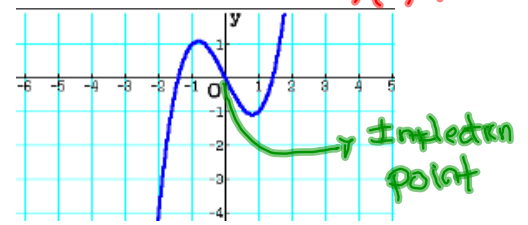
35.  $h(x) = x^4 - 2x^2$

33)



$f(x) = x^3$

34)



Note: 33 & 34 on your own.

