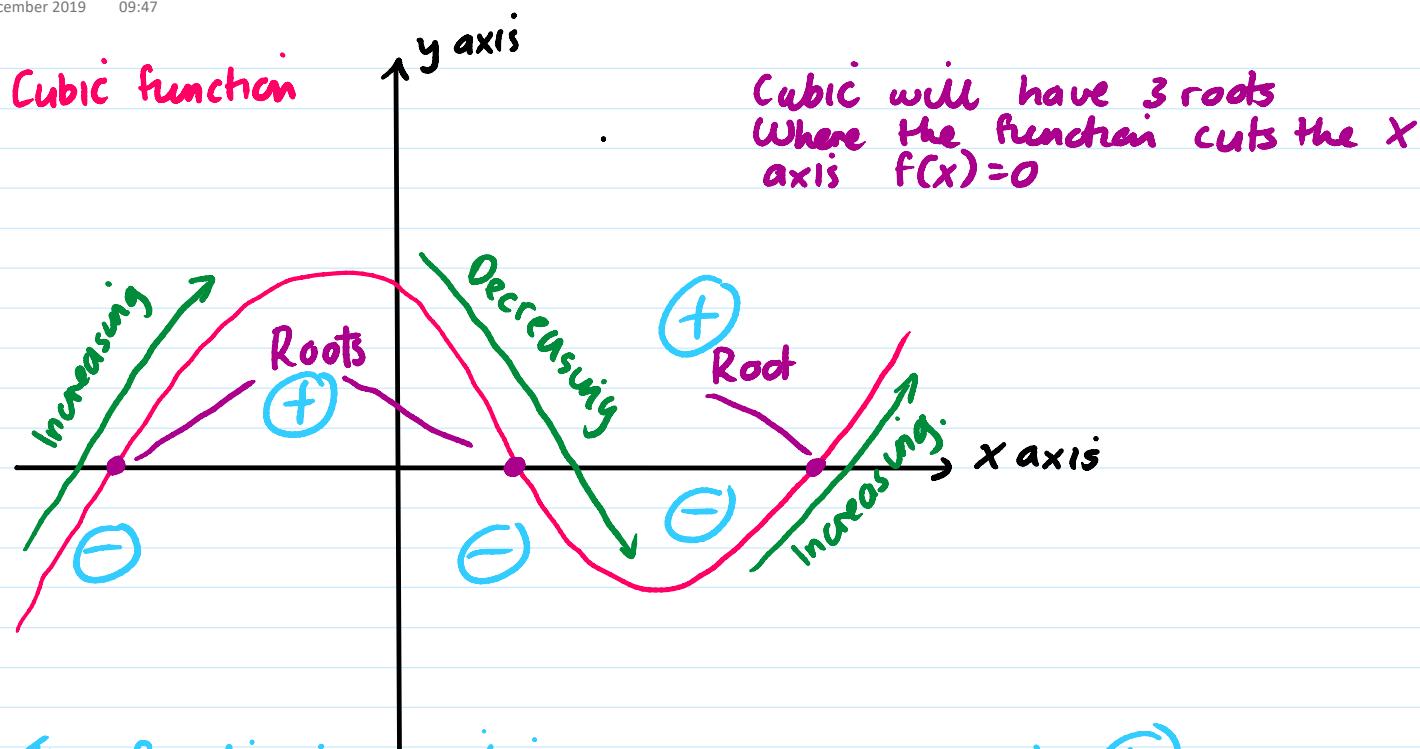


Cubic Functions

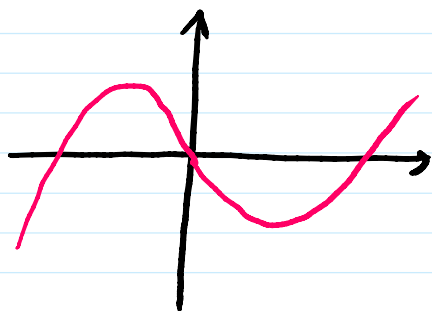
10 December 2019 09:47



The function is positive above the x axis (+)

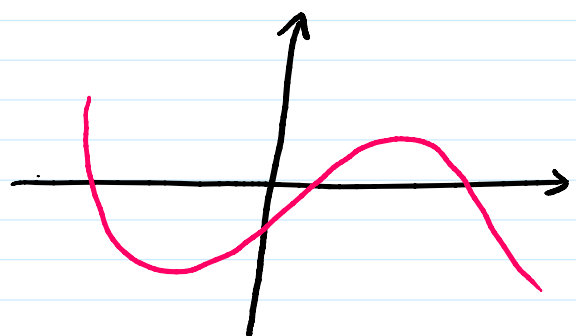
The function is negative below the x axis (-)

The shape of the graph depends on the coefficient of x^3



$$+ ax^3 \quad a > 0$$

The graph will start increasing



$$- ax^3 \quad -a < 0$$

The graph will start decreasing



T&T3 17.5



T&T3
17.5.pptx

PROJECT MATHS

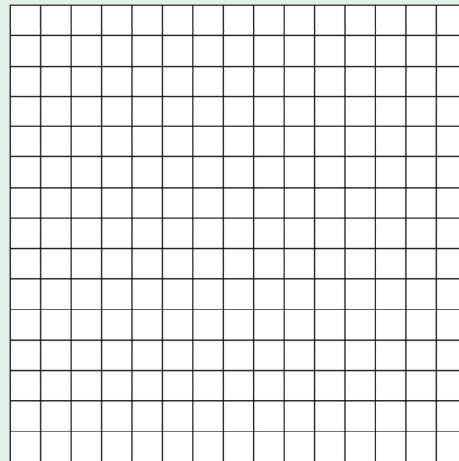
Text & Tests

Leaving **3** Certificate

Section 17.5 Cubic functions

Example 1

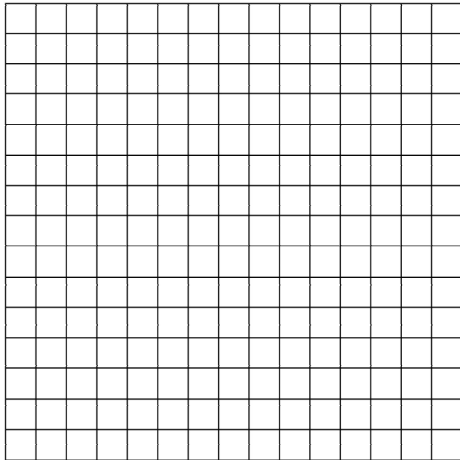
Draw the graph of the function $f: x \rightarrow x^3 - 3x^2 - x + 3$, in the domain $-2 \leq x \leq 4$.



Exercise 17.5

1. Copy and complete the table given on the right.

Use this table to draw the graph of the function $f(x) = x^3 + 3x^2 - x - 3$ in the domain $-4 \leq x \leq 2$, $x \in R$.

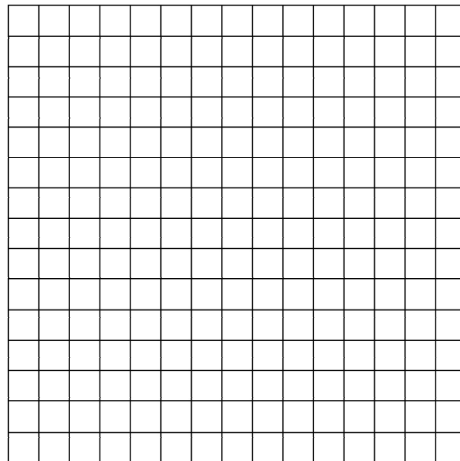


| x | $x^3 + 3x^2 - x - 3$ | y |
|-----|----------------------|-----|
| -4 | $-64 + 36 + 4 - 3$ | -27 |
| -3 | | |
| -2 | | |
| -1 | | |
| 0 | | |
| 1 | | |
| 2 | | |

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Exercise 17.5

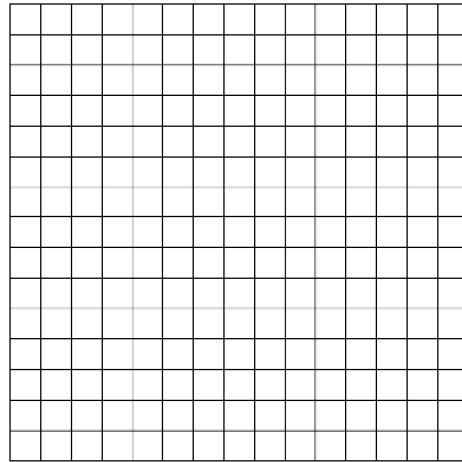
3. Graph the function $f(x) = x^3 - 5x + 2$ in the domain $-3 \leq x \leq 3$, $x \in R$.



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Exercise 17.5

2. Draw a graph of the function $y = x^3 - 2x^2 - 4x$ in the domain $-2 \leq x \leq 4, x \in \mathbb{R}$.

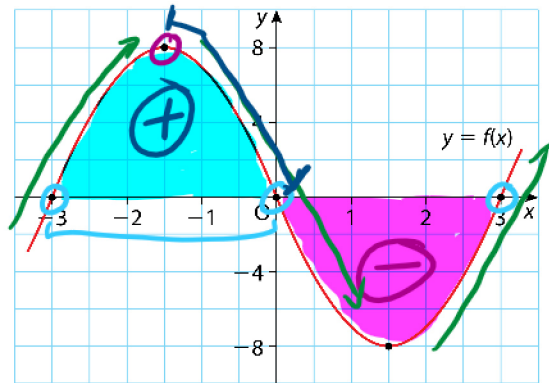


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Exercise 17.5

Pg 491

4. The diagram below shows the graph of a function $y = f(x)$.



Use the graph to write down

- the roots of the equation $f(x) = 0$ *Cuts x axis $x = -3, x = 0, x = 3$*
- the domain of values of x for which $f(x)$ is positive *x values $-3 \leq x \leq 0$ ⊕*
- the values of x for which $f(x)$ is positive and decreasing *$-1.5 \leq x \leq 0$*
- the coordinates of the maximum turning point *$(-1.5, 8)$ Max*
- the coordinates of the minimum turning point. *$(1.5, -8)$ Min.*

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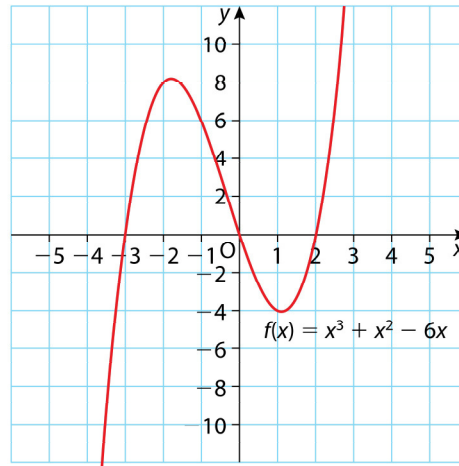
Exercise 17.5

HW Pg 492 Q5+6

5. The diagram on the right shows the graph of the function $f(x) = x^3 + x^2 - 6x$.

Use the graph to write down

- (i) the roots of the equation $f(x) = 0$
- (ii) the coordinates of the minimum turning point
- (iii) the values of x for which $f(x)$ is positive
- (iv) the values of x for which $f(x)$ is negative and decreasing.



Exercise 17.5

HW

6. If $f(x) = x^3 + 2x^2 - 7x - 3$, copy and complete the following table:

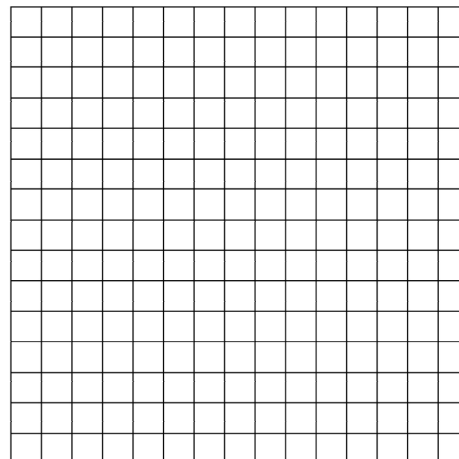
| | | | | | | | | |
|----------|----|----|----|----|---|----|---|----|
| $x =$ | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
| $f(x) =$ | -7 | | | | | -7 | | 21 |

Draw the graph of the function

$f(x) = x^3 + 2x^2 - 7x - 3$ in the domain $-4 \leq x \leq 3, x \in R$.

Use your graph to estimate

- (i) the roots of the equation $f(x) = 0$
- (ii) the domain of values of x for which $f(x)$ is decreasing
- (iii) the coordinates of the minimum turning point.

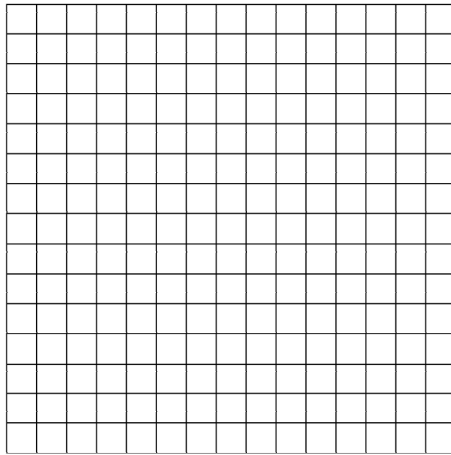


Exercise 17.5

7. Copy and complete the table of values for $y = 6x + x^2 - x^3$.

| | | | | | | | | |
|----------|----|----|----|---|---|---|---|---|
| x | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| y | | 0 | -4 | | | 8 | 0 | |

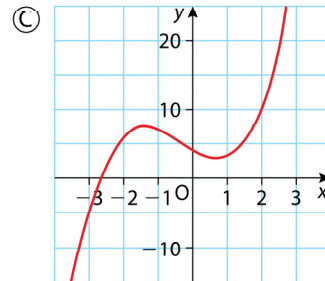
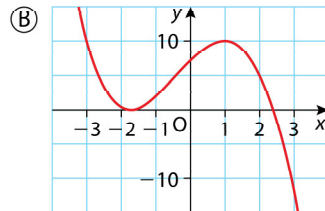
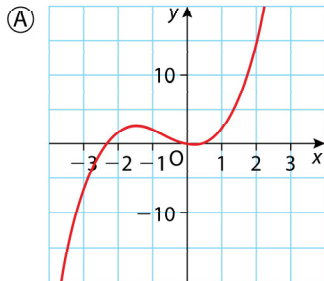
- Draw a graph of the function $y = 6x + x^2 - x^3$ in the domain $-3 \leq x \leq 4$.
- How is this graph different from the graphs you have drawn so far?
- Write down the roots of the equation $y = 0$.
- Use your graph to estimate the coordinates of the minimum turning point.
- For what values of x is y negative and decreasing?



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Exercise 17.5

8. Here are the graphs of three cubic functions, $f(x) = \dots$



- Which graph represents a function in which the coefficient of x^3 is negative?
- Which graph has only one real root for the equation $f(x) = 0$?
- In which graph is $f(x)$ positive for $-2.5 < x < 0$?
- Which graph is negative and decreasing for $x > 2.4$?

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Exercise 17.5

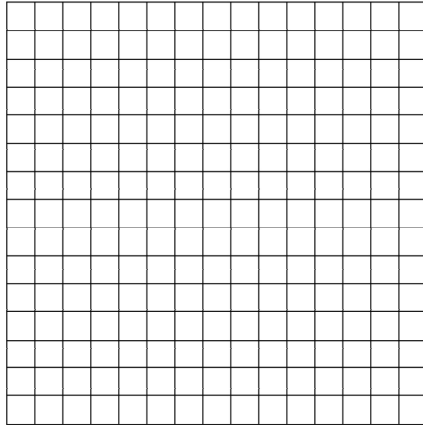
9. If $f(x) = -2x^3 + 3x^2 + 5x - 6$, complete the following table:

| | | | | | | |
|----------|----|----|---|---|---|-----|
| $x =$ | -2 | -1 | 0 | 1 | 2 | 3 |
| $f(x) =$ | | -6 | | | | -18 |

Draw the graph of the function $f: x \rightarrow -2x^3 + 3x^2 + 5x - 6$ in the domain $-2 \leq x \leq 3$.

Use your graph to estimate

- the roots of the equation $f(x) = 0$
- the coordinates of the maximum turning point
- the values of x for which $f(x) > 0$
- the values of $x < 0$ for which $f(x)$ is negative and decreasing.



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Exercise 17.5

10. Associate each sketch-graph below with one of the given equations:

$$y = x^3 - x^2$$

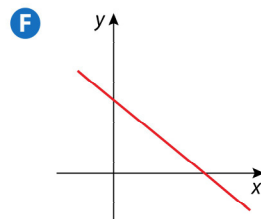
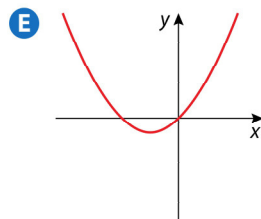
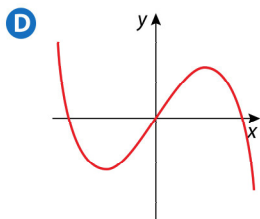
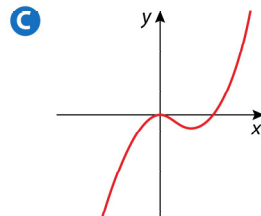
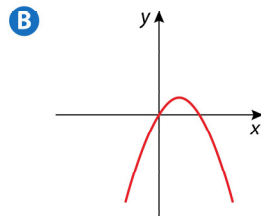
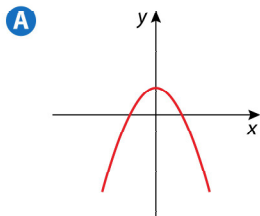
$$y = 1 - x^2$$

$$y = x - x^2$$

$$y = -\frac{3}{4}x + 3$$

$$y = x^2 + 3x$$

$$y = 9x - x^3$$



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Answers 17.5

1. $(-4, -15), (-3, 0), (-2, 3), (-1, 0), (0, -3), (1, 0), (2, 15)$
4. (i) $-3, 0, 3$ (ii) $-3 < x < 0; x > 3$
(iii) $-1.5 < x < 0$ (iv) $(-1.5, 8)$
(v) $(1.5, -8)$
5. (i) $-3, 0, 2$ (ii) $(1.1, -4)$
(iii) $-3 < x < 0; x > 2$ (iv) $0 < x < 1.1$
6. $(-4, -7), (-3, 9), (-2, 11), (-1, 5), (0, -3), (1, -7), (2, -1), (3, 21);$
(i) $-3.7, -0.4, 2.1$
(ii) $-2.3 < x < 1$
(iii) $(1, -7)$
7. $(-3, 18), (0, 0), (1, 6), (4, -24)$
(ii) decreases first
(iii) $x = -2, 0, 3$
(iv) $(-1.1, -6.7)$
(v) $-2 < x < -1.1; x > 3$
8. (i) B (ii) C (iii) A (iv) B
9. (i) $-1.5, 1, 2$
(ii) $(1.5, 1.5)$
(iii) $-2 < x < -1.5; 1 < x < 2$
(iv) $-1.5 < x < -0.5$
10. A: $y = 1 - x^2$; B: $y = x - x^2$; C: $y = x^3 - x^2$;
D: $y = 9x - x^3$; E: $y = x^2 + 3x$;
F: $y = -\frac{3}{4}x + 3$