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**MATHEMATICS**

**SPECIALIST**

**UNIT 3**

**Semester One**

**2018**

**SOLUTIONS**

***Calculator−free Solutions***

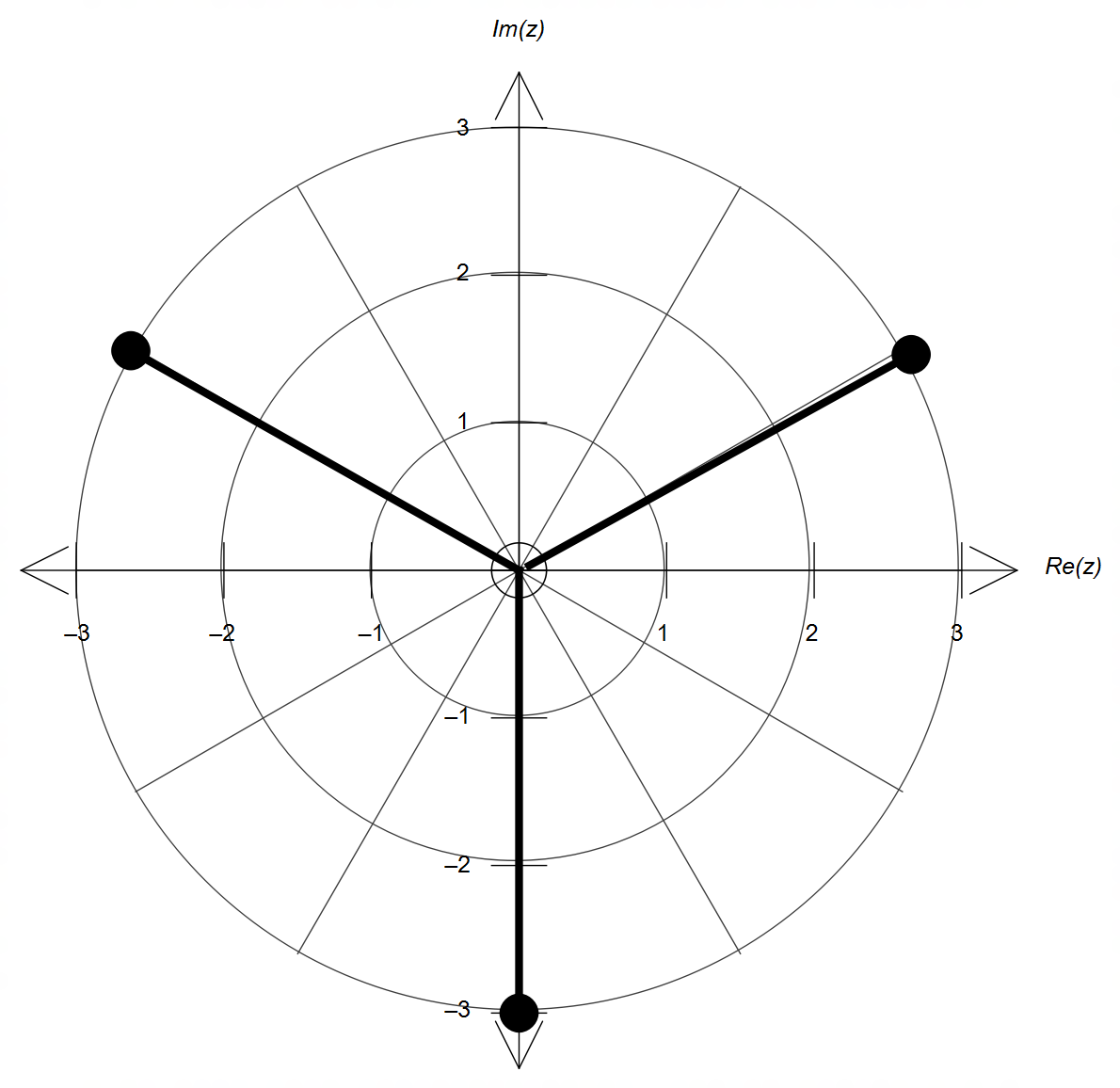
1. Since are roots, then is a factor. ✓

dividing by gives the quadratic factor ✓

and using the quadratic formula gives ✓✓

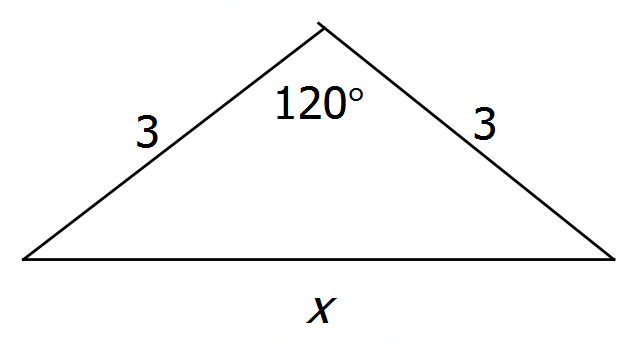
✓ [5]

2. (a) ✓✓

 (b)

✓ magnitude = 3

✓ radians apart

 (c)

✓

✓

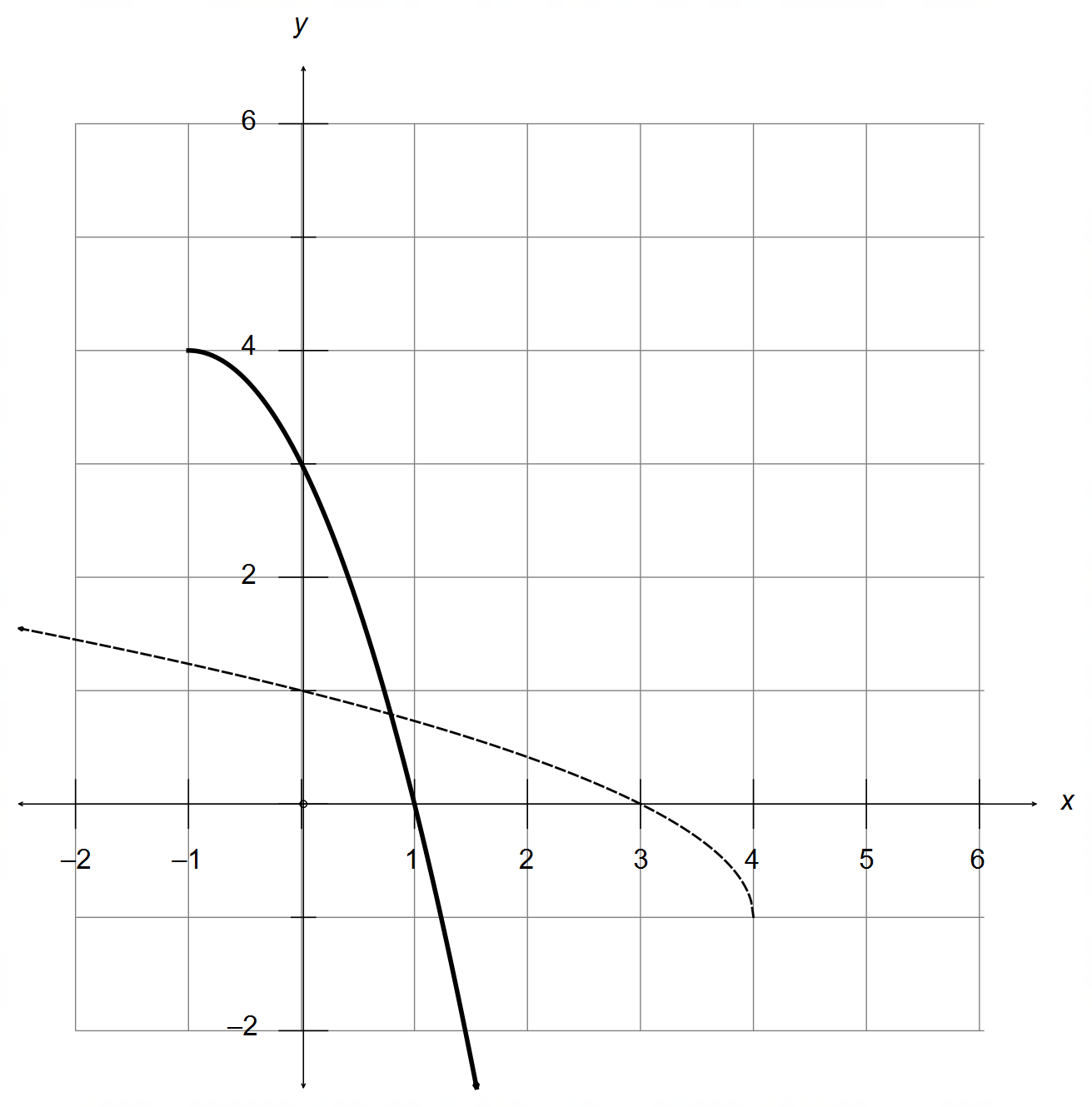
perimeter units, ✓ [7]

3. (a) ✓

✓

(b) ✓

✓✓✓ [6]

4. (a)

✓ intersects f(x)

along the line y=x

✓ correct shape and location

(b) ✓✓

Domain ✓

(c) ✓

(d) Condition for composition to exist: ✓

✓

no changes needed for the domain of ✓

Range ✓ [10]

5. (a) ✓

OR ✓

(b) Use as the normal vector of the plane ✓

✓

✓

5. (c) ✓✓

✓

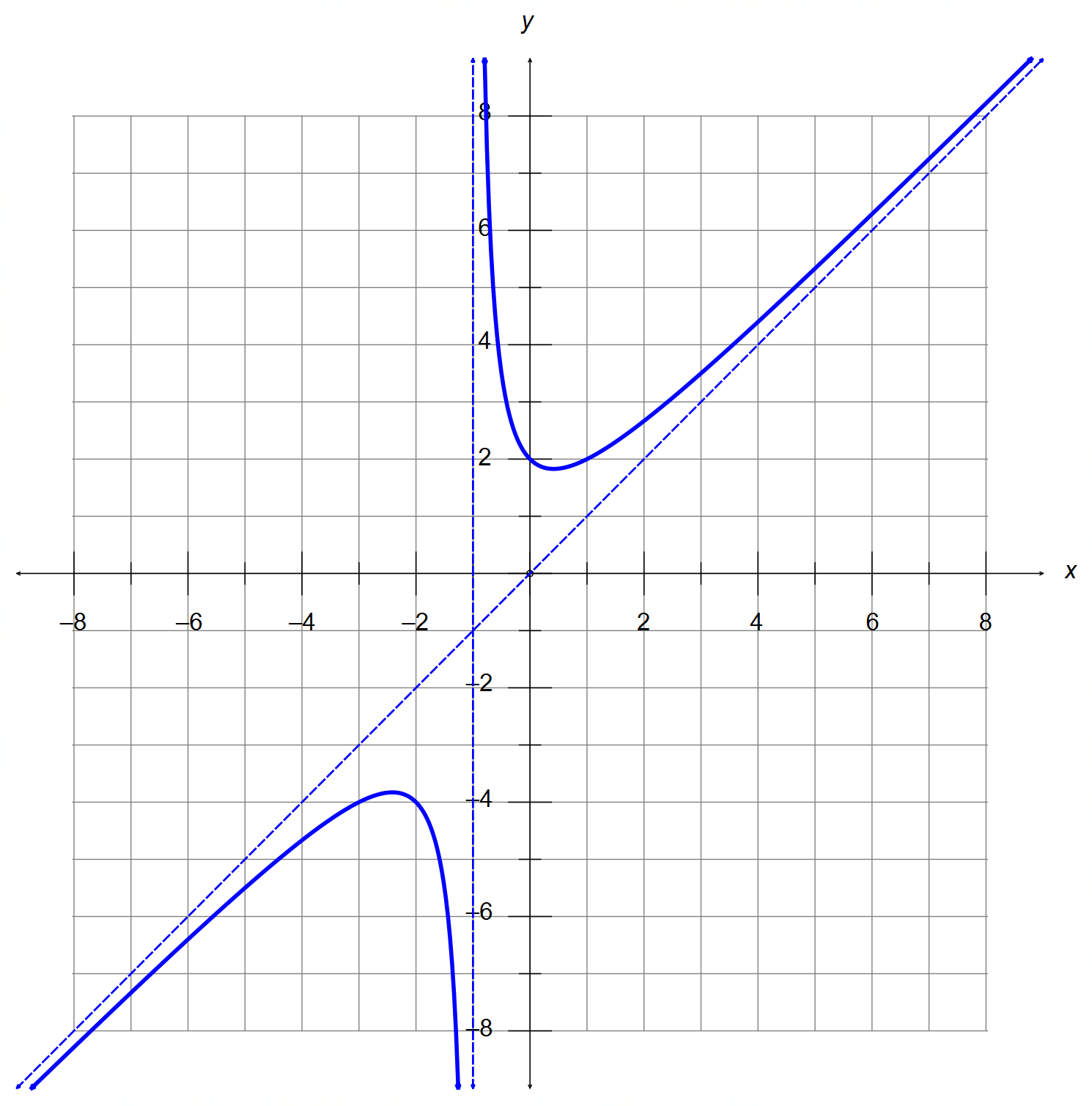
(d) Radius ✓

Centre ✓

✓

✓ [12]

6. (after long division or otherwise) ✓



✓ Vertical asymptote x=-1

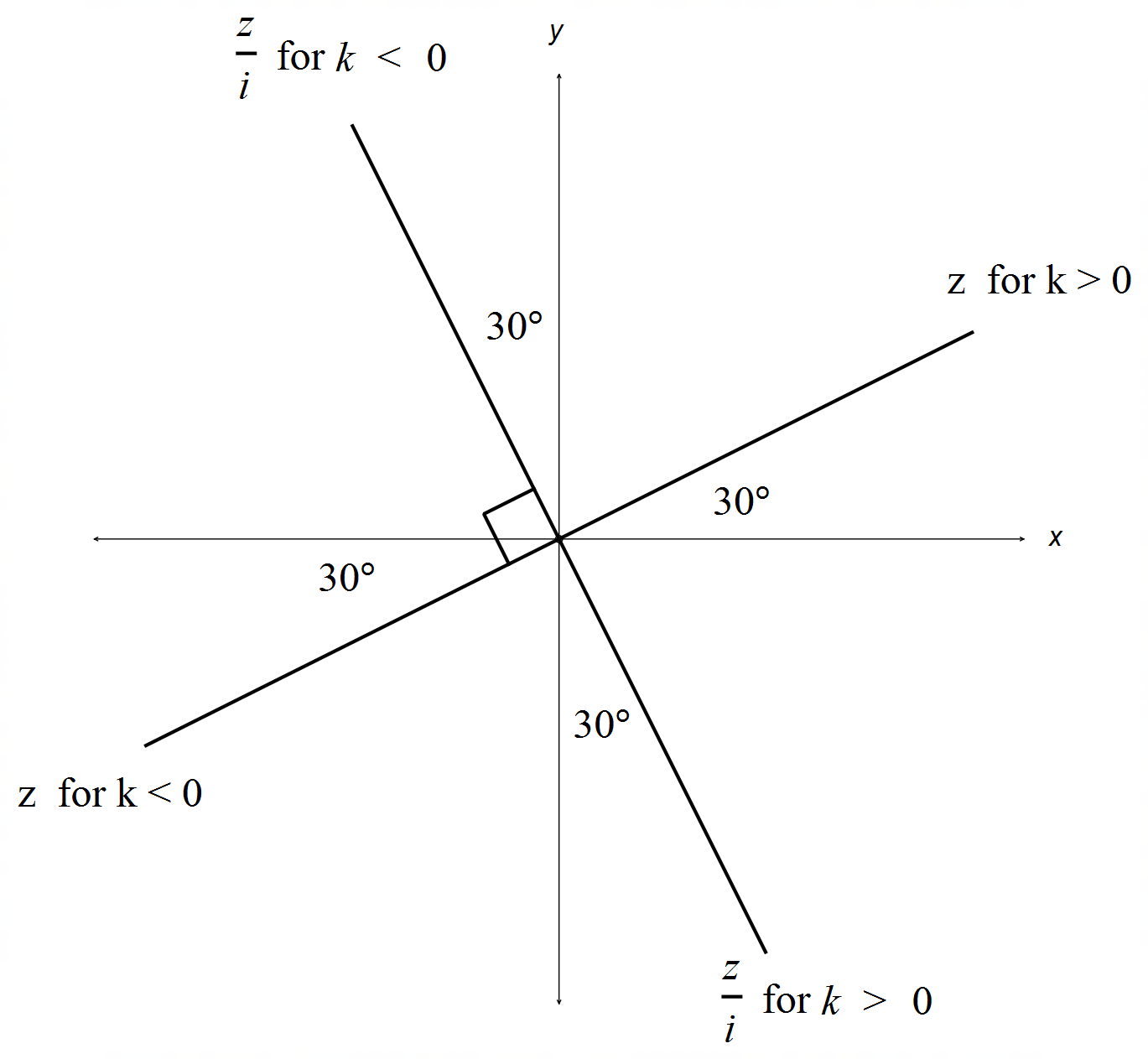
✓ Oblique asymptote y=x

✓ y intercept at (0,2)

✓ Shape and accuracy

[5]

7. (a) ✓

 (b)

for ✓

for ✓

(c) for ✓

for ✓ [5]

***Calculator−Assumed Solutions***

8. For ABC to be collinear, AB // AC // BC (any two)

✓

✓

✓✓ [4]

9. (a) ✓✓

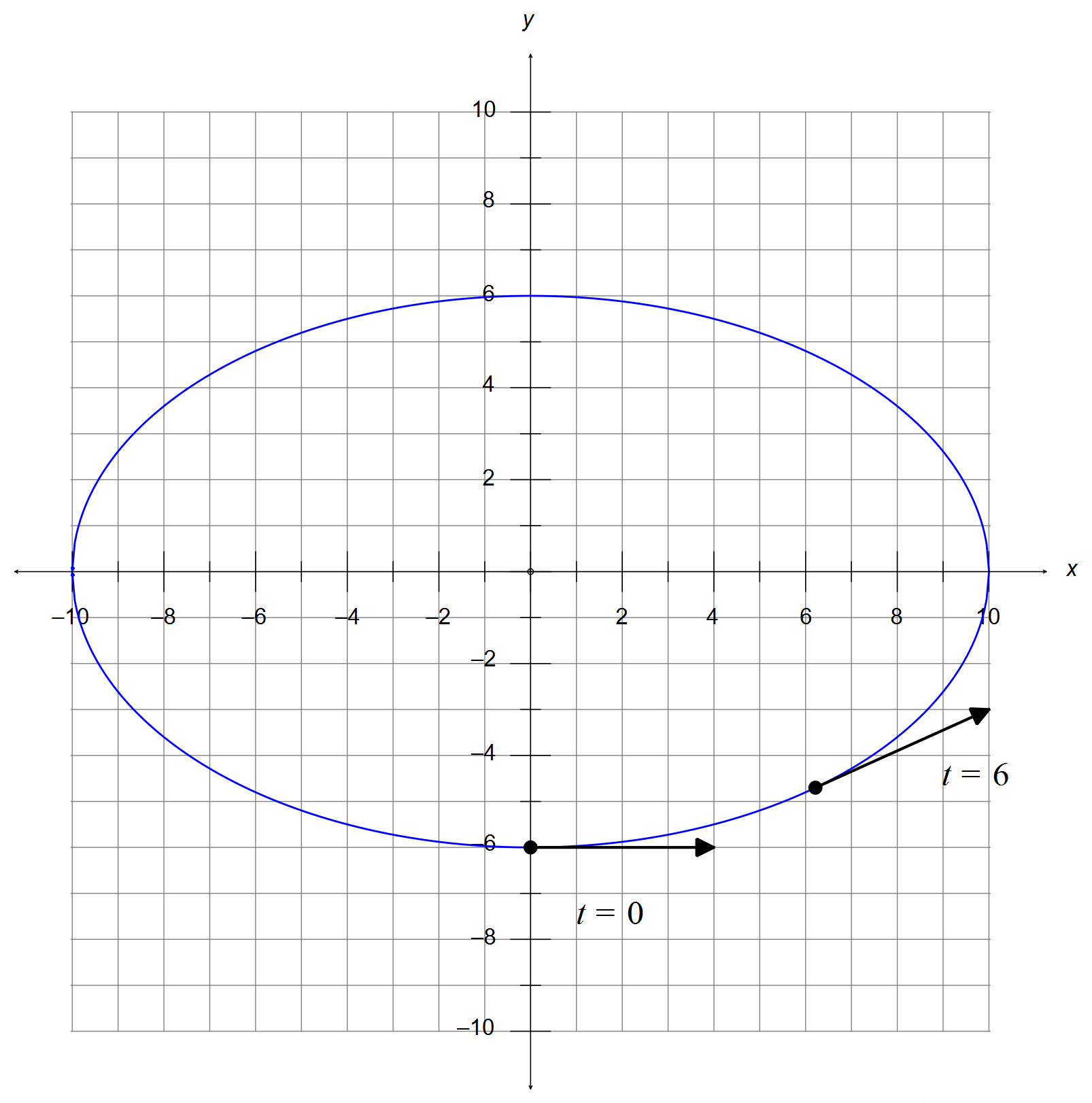
(b) ✓✓

(c) speed ✓✓

max speed at or

✓

✓✓

 (d) Elliptical path with intercepts and ✓✓

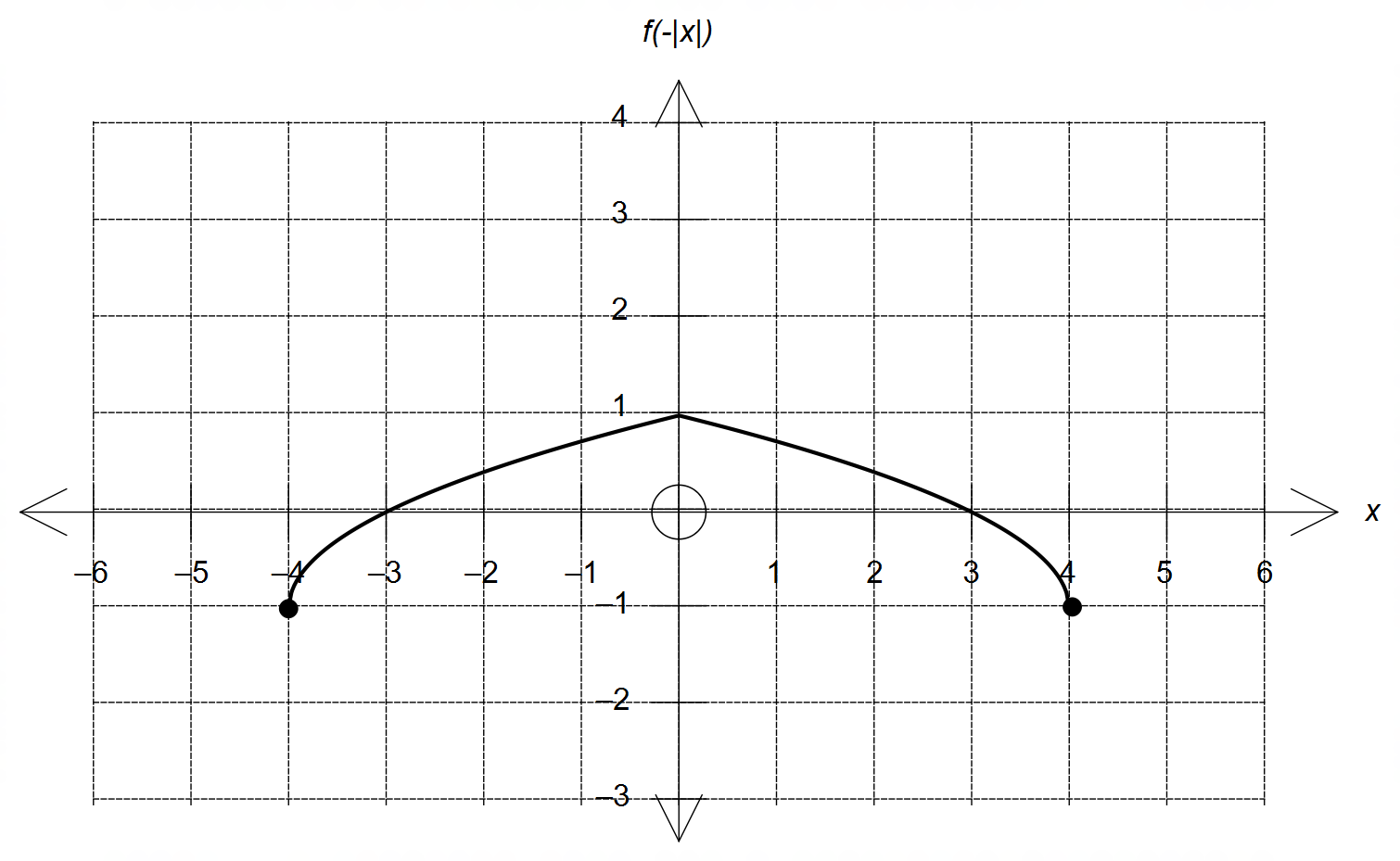
✓

✓

✓

✓

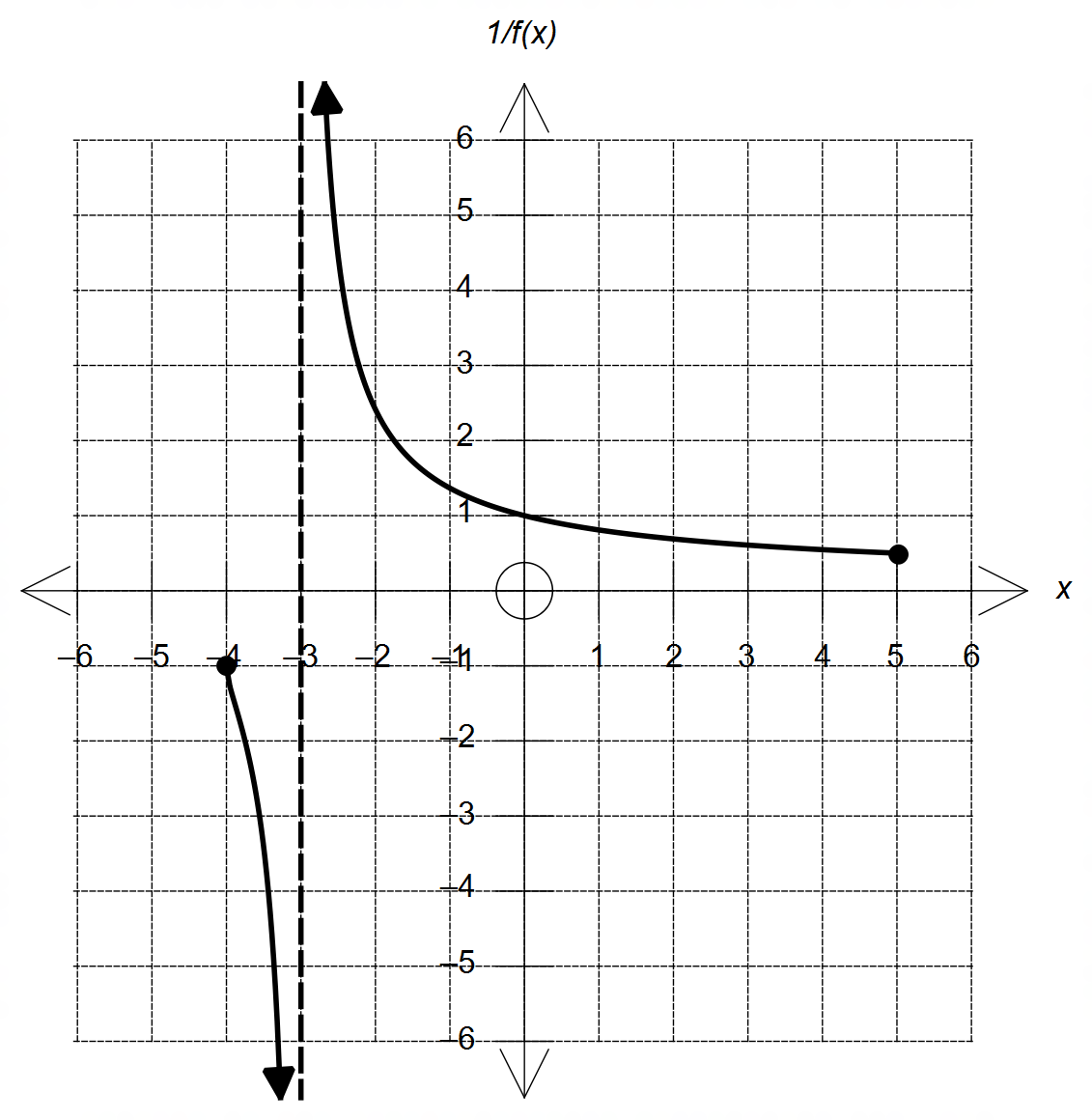
[15]

10. (a)

✓ Mirror image curve

over the y axis

✓ Location and accuracy

 (b)

✓ Vertical asymptote

x = -3

✓ Indicates y →|∞|

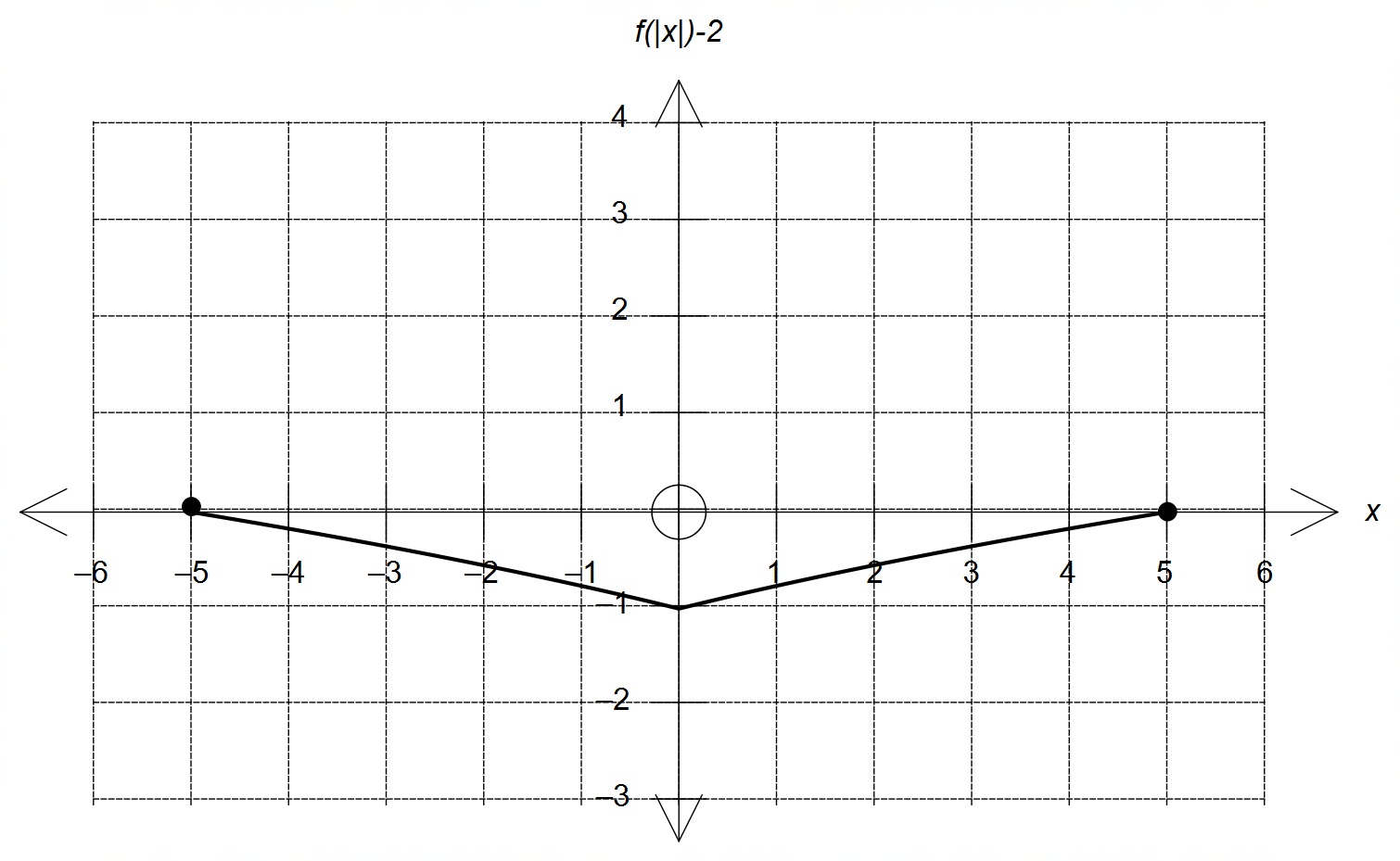
as |x| → -3

✓ Correct domain.

✓ crosses f(x) when

y=1 or -1

(c) from the graph below ✓✓ [8]



11. (a) (i) ✓

✓✓

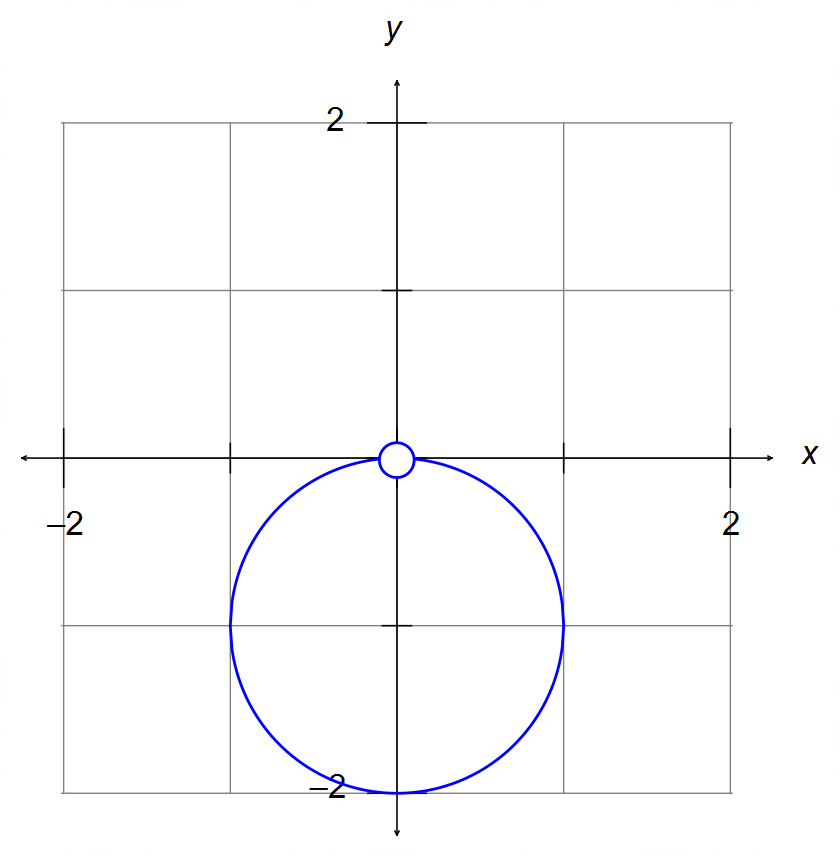
(i) ✓

✓✓

(b) Let and

✓

✓



✓ circle centred at

(0,-1) with radius = 1

✓ discontinuity at the origin

[10]

12. (a)

✓

km/h ✓

12. (b)

✓

✓

✓

✓

(c) From :

where

Condition for collision:

✓

✓

and ✓

CAS: or 1.75 ~ 2 min (1502hrs) ✓

and km/h ✓ [11]

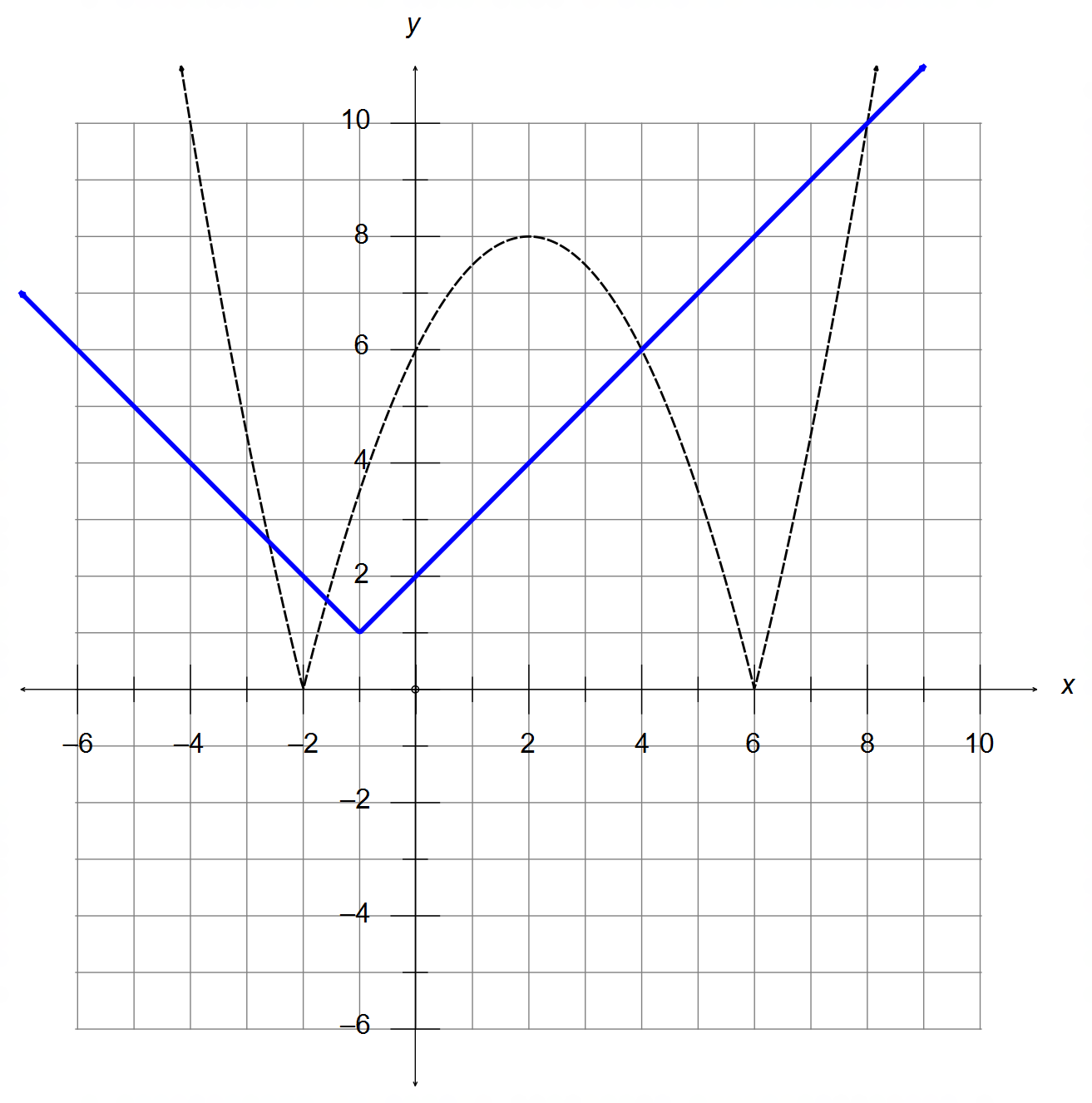
13. (a)

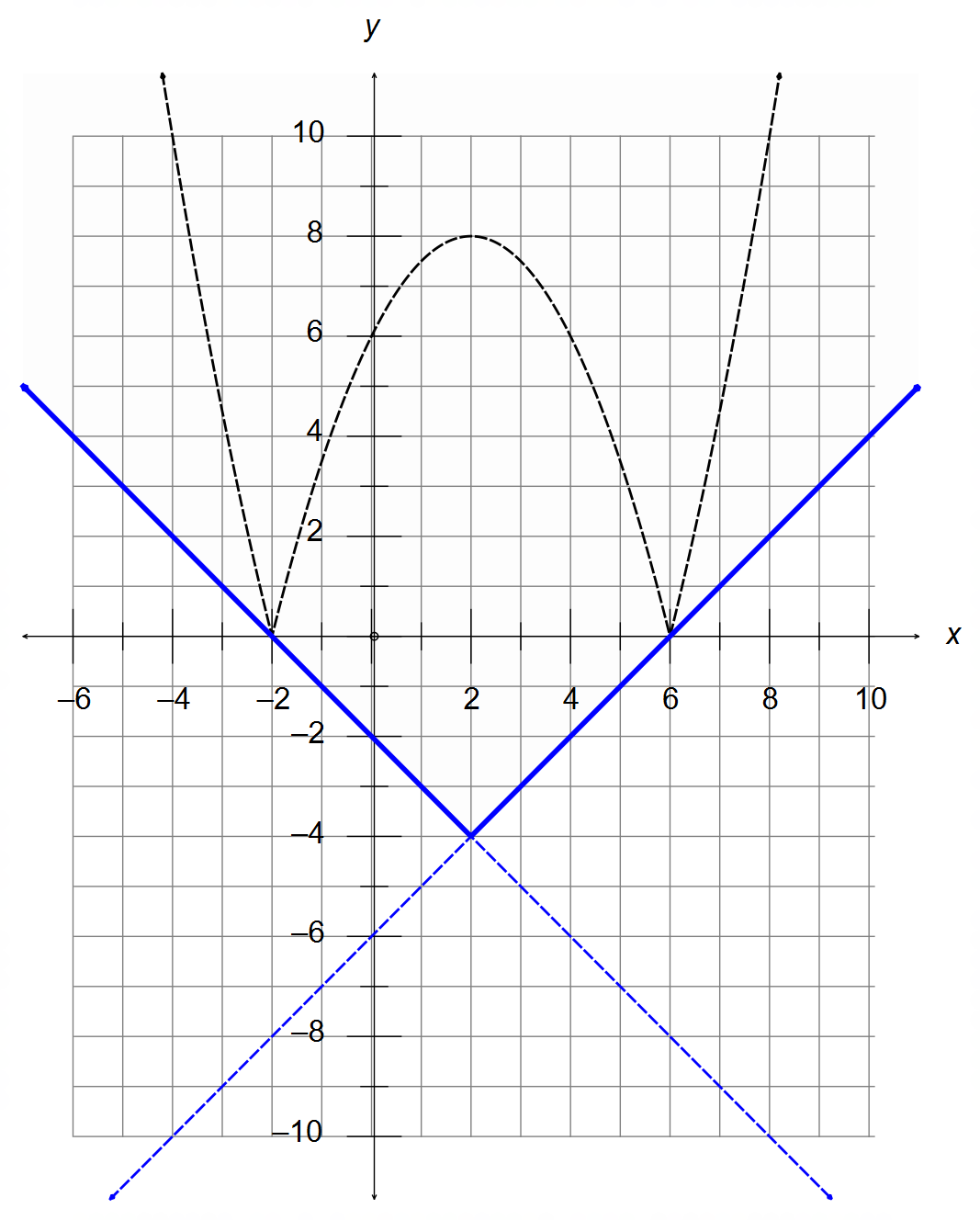
✓✓

OR

✓

(BOTH solutions must be given)

13. (b) ✓✓

 (c)

From the diagram above:

(i) ✓✓

OR ✓

(both solutions must be given)

(ii) ✓

AND ✓ [10]

14. (a) ✓

centre at and radius ✓✓

(b)

centre at and radius ✓✓

(c) ✓

✓

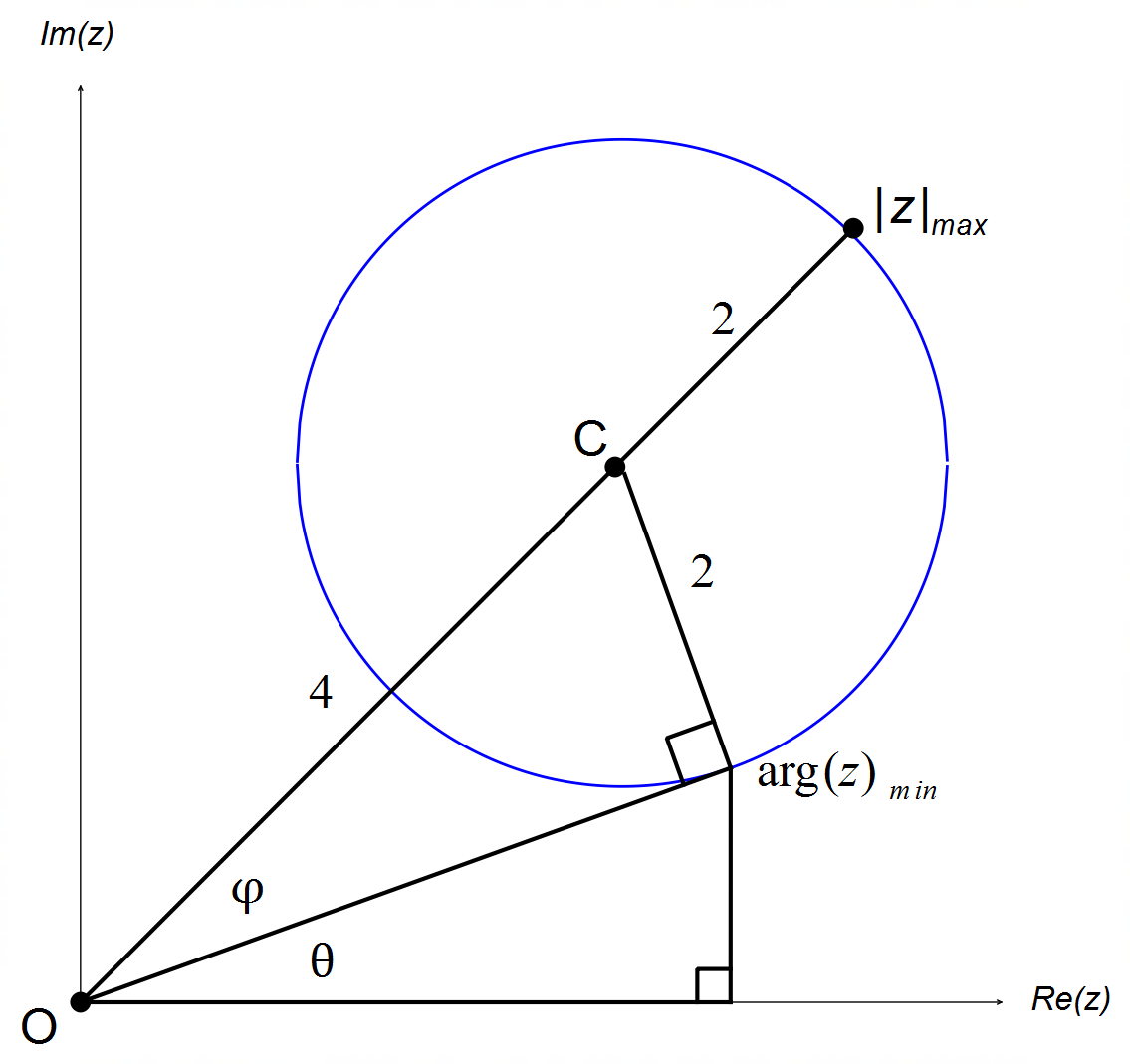
and ✓

(d)

✓

✓ [10]

15. (a) See diagram below.



(i) units ✓✓

(ii) ✓

✓

✓

(b) (i) ✓

✓

(ii) ✓

✓

✓✓

as required [11]

16. (a) ✓✓

is its own inverse ✓

(b)

Domain ✓

Range ✓

(c) Since and are perpendicular, a reflection

of does not affect the symmetry of over ✓

therefore, the reflected function continues to be its own inverse ✓

(d) ✓

✓

✓ [10]

17. ✓

✓

is also a root of ✓

✓

✓

is also a root of ✓ [6]

18. ✓

✓

✓

Domain ✓

Range ✓ [5]