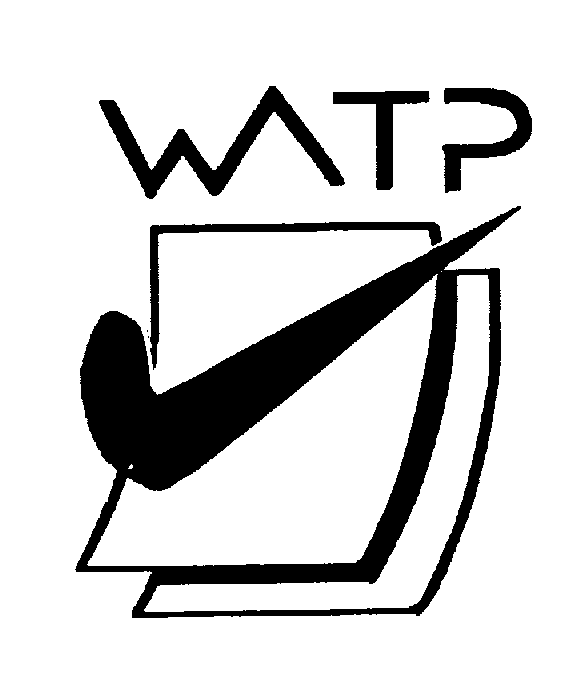
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**SEMESTER TWO**

**MATHEMATICS**

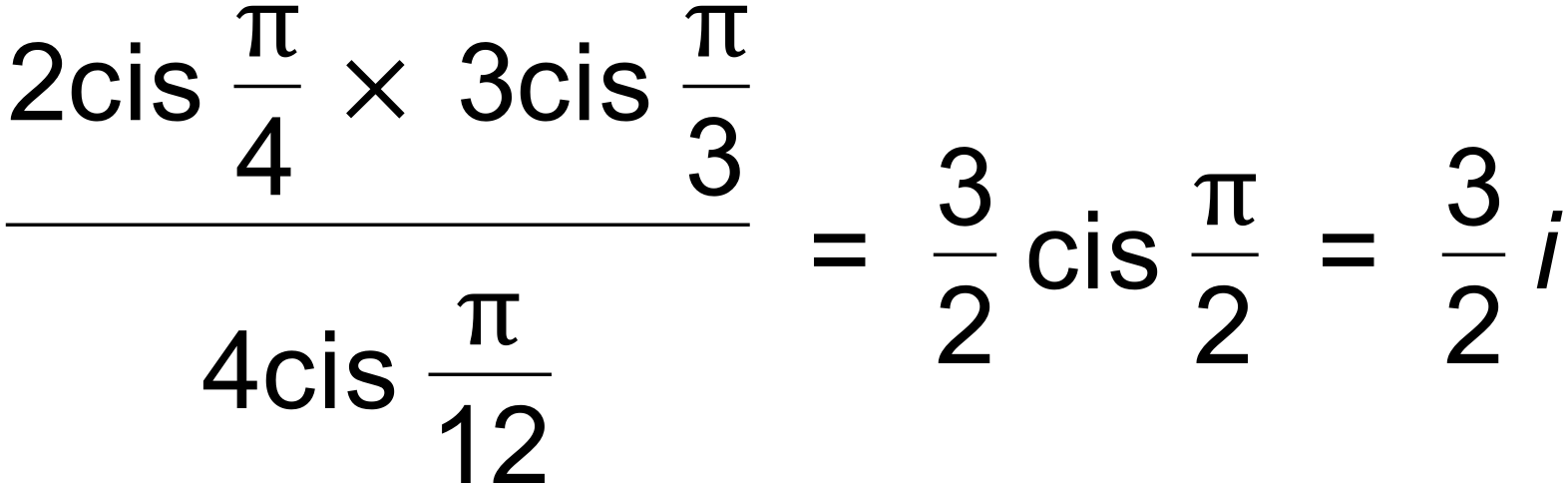
**SPECIALIST**

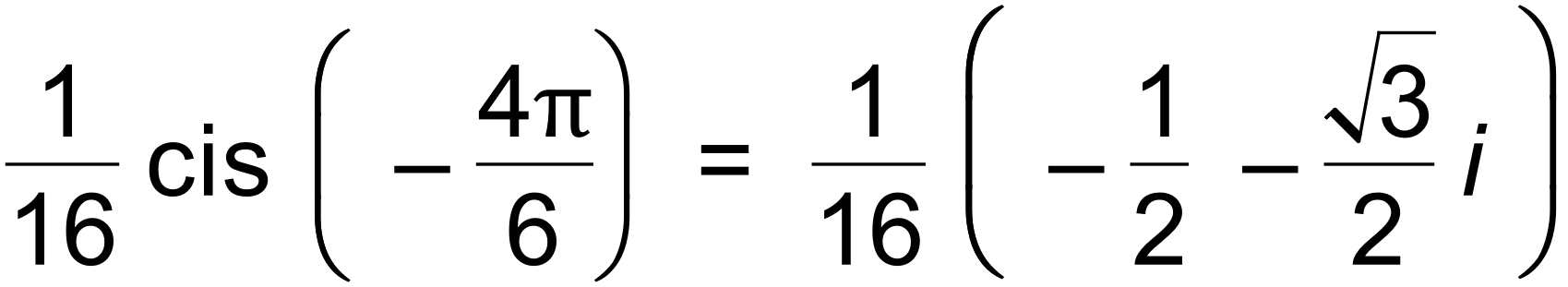
**UNITS 3 & 4**

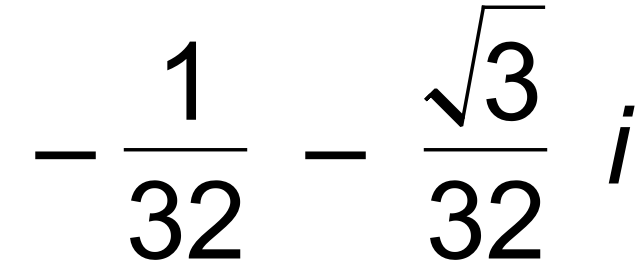
**2017**

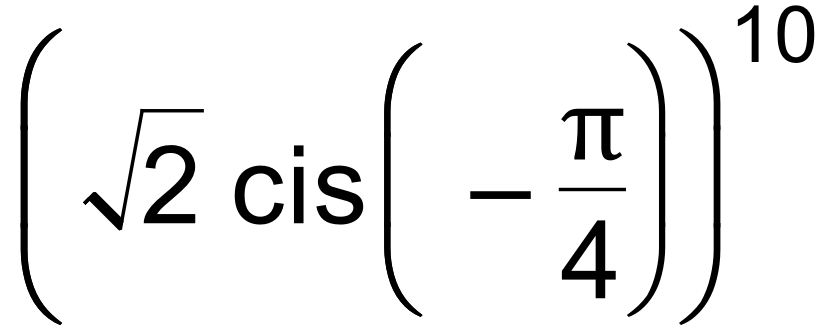
**SOLUTIONS**

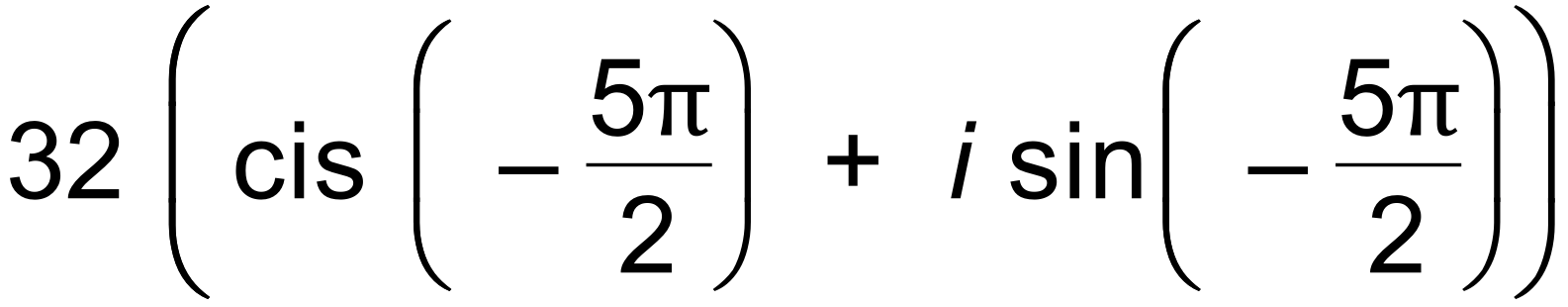
***Calculator−free Solutions***

1. (a)  ✓

(b)  ✓

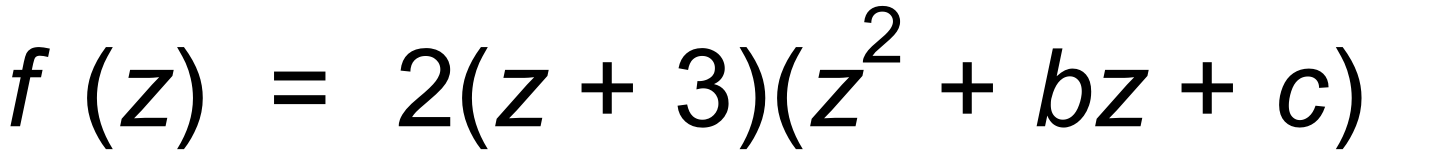
=  ✓

(c)  ✓

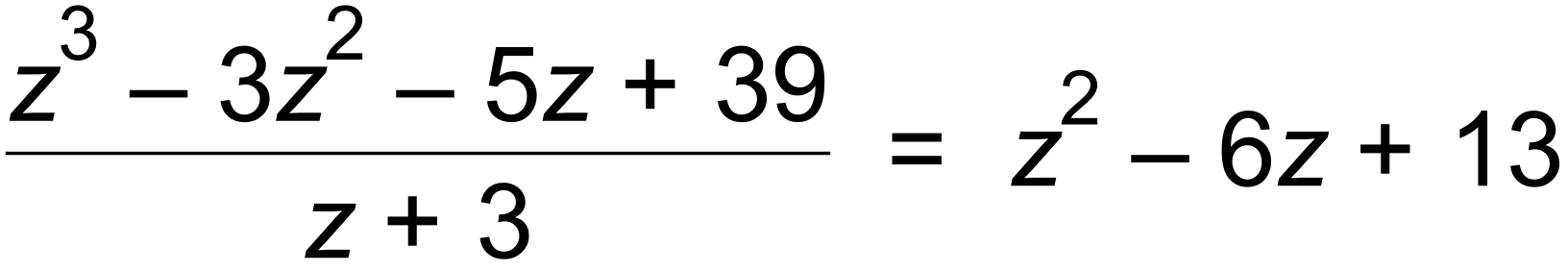
=  ✓

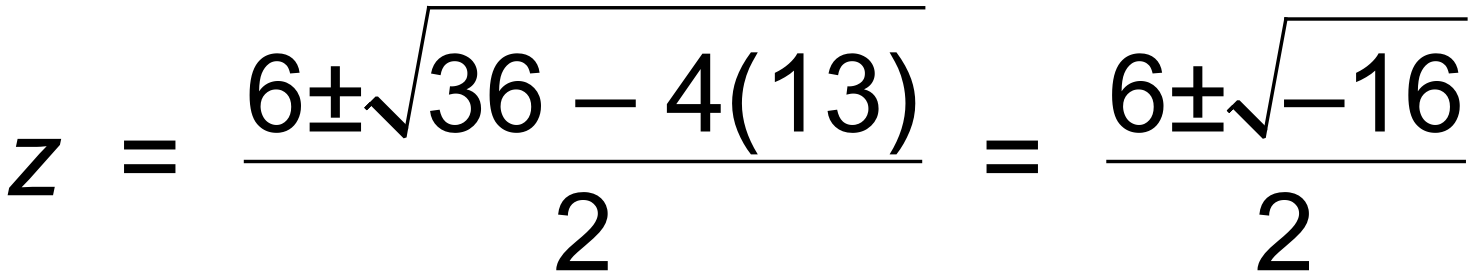
=  ✓ [6]

2. *f* (−3) = 0 so *z* + 3 is a factor

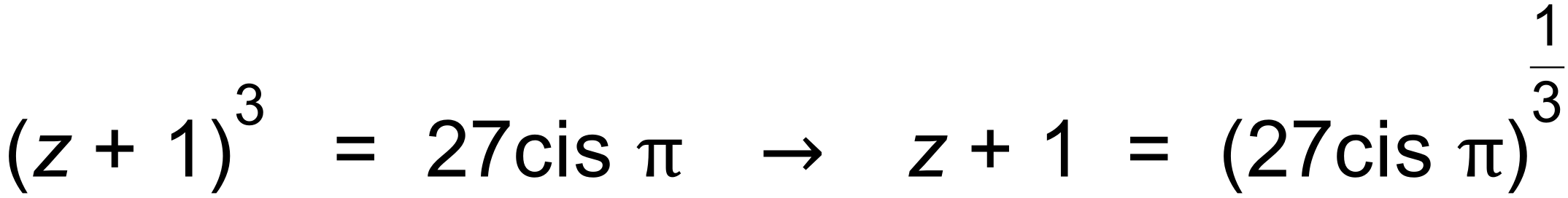
 ✓

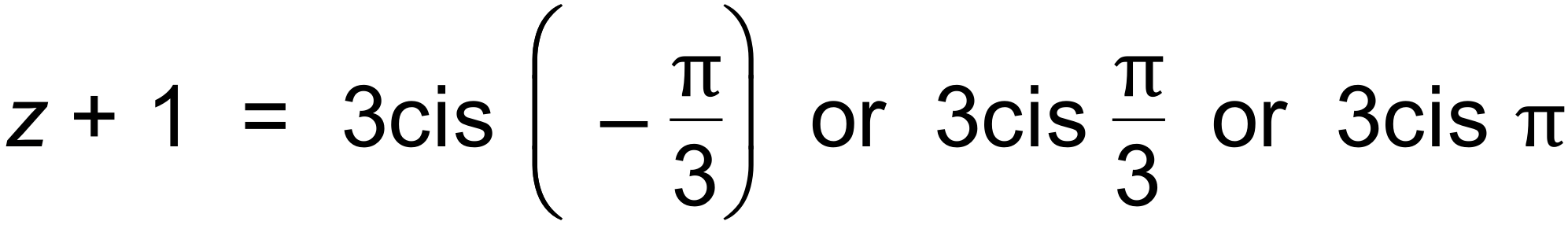
∴ *c* = 13 and *b* = −6 by equating coefficients or division

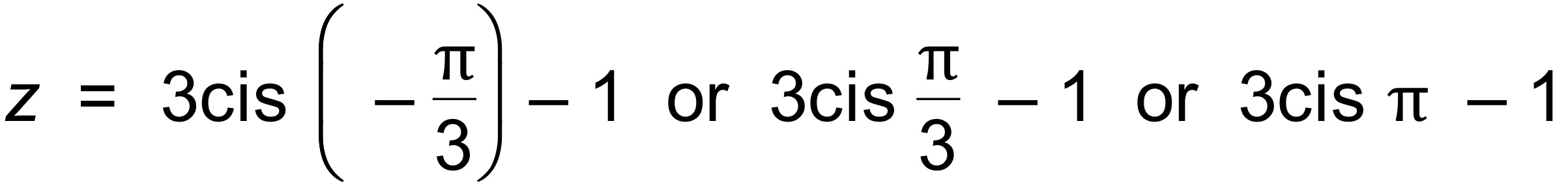
 ✓

∴  ✓

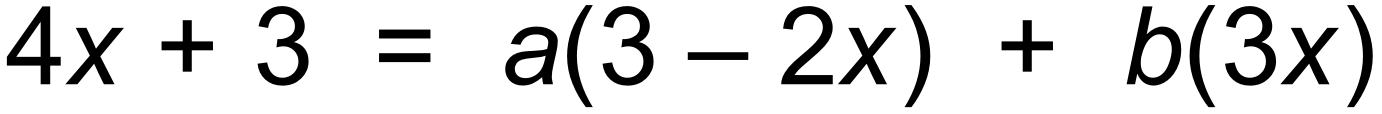
∴  ✓ [4]

3.  ✓

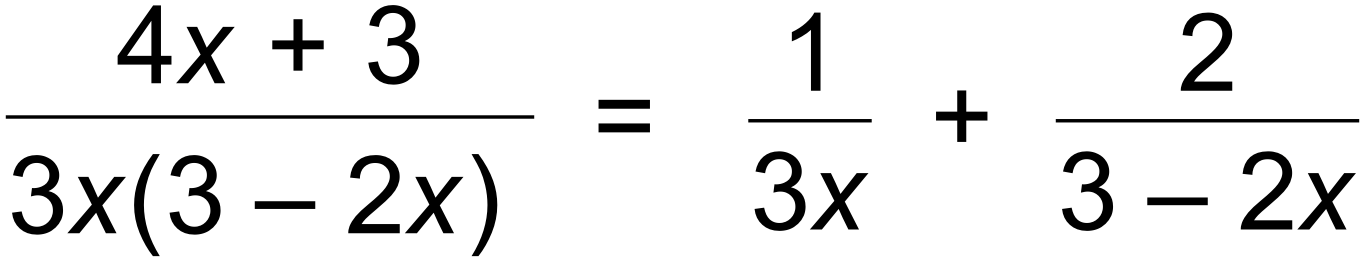
∴  ✓✓

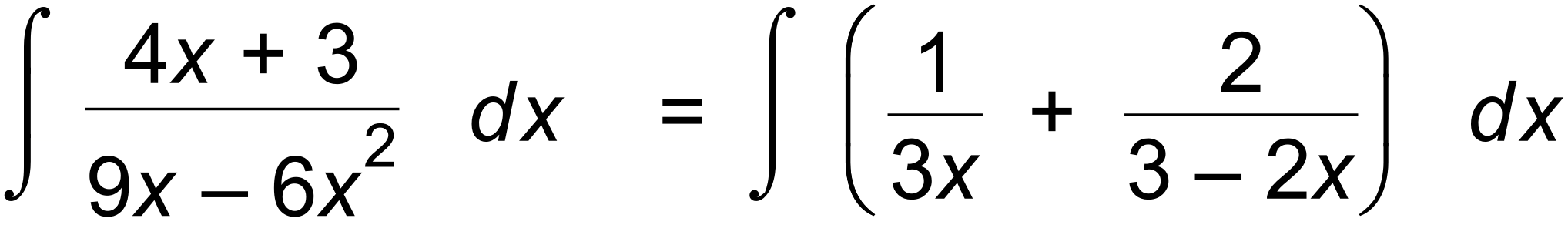
∴  ✓ [4]

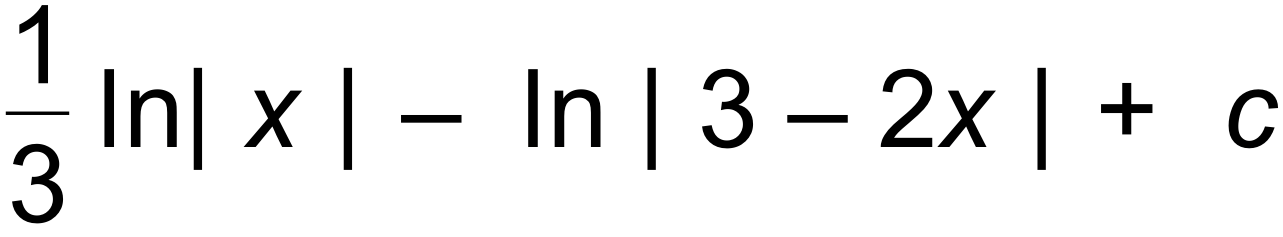
4. (a)  ✓

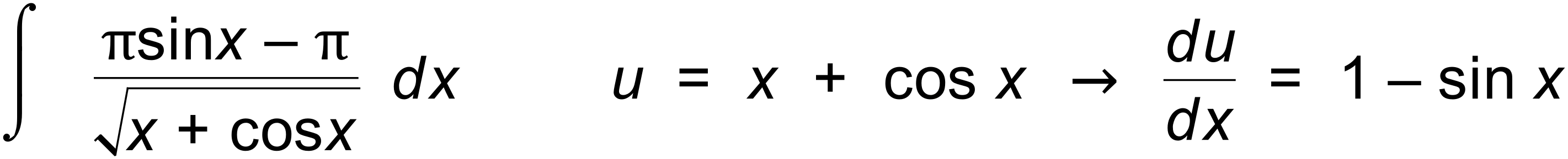
∴ 

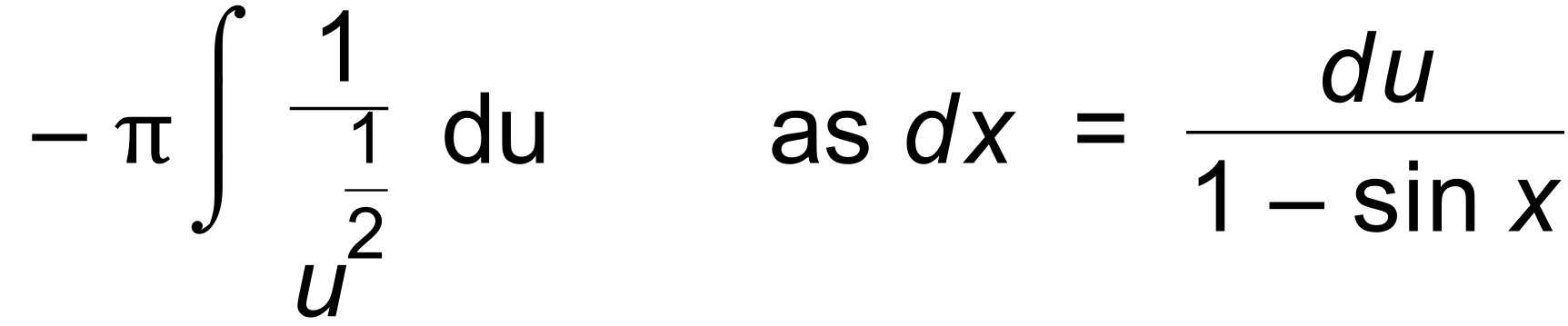
∴  ✓

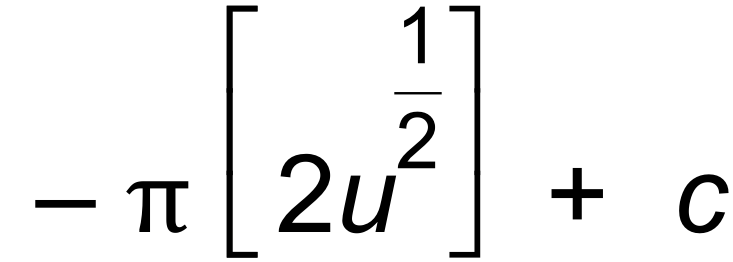
∴  ✓

(b)  ✓

=  ✓✓ [6]

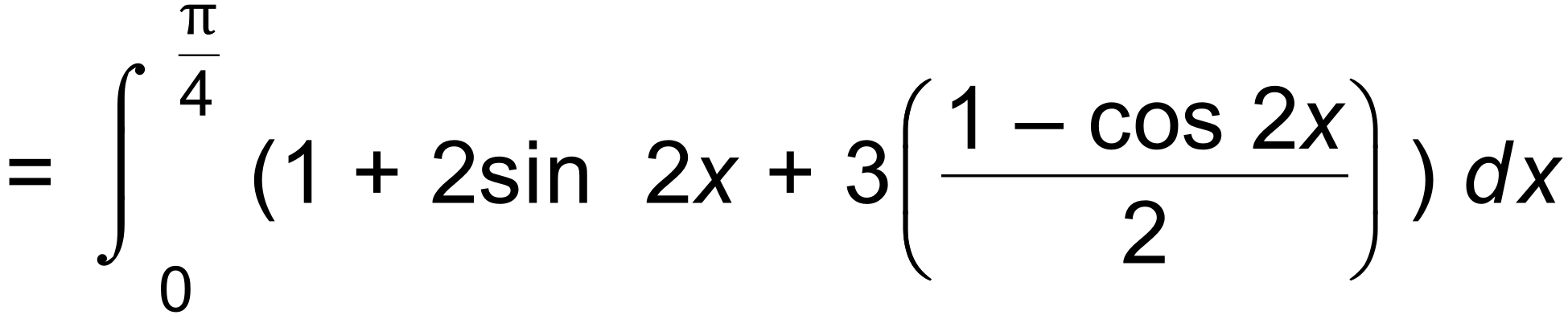
5. (a)  ✓

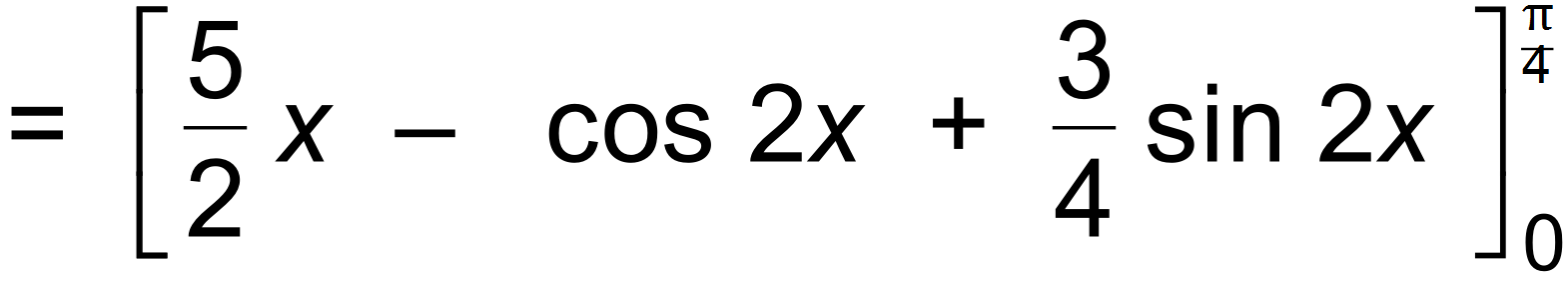
=  ✓

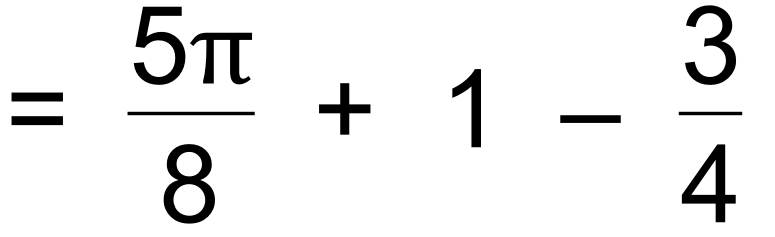
=  ✓

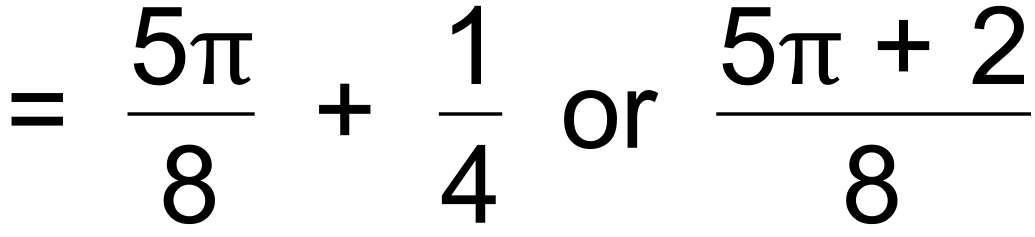
=  ✓

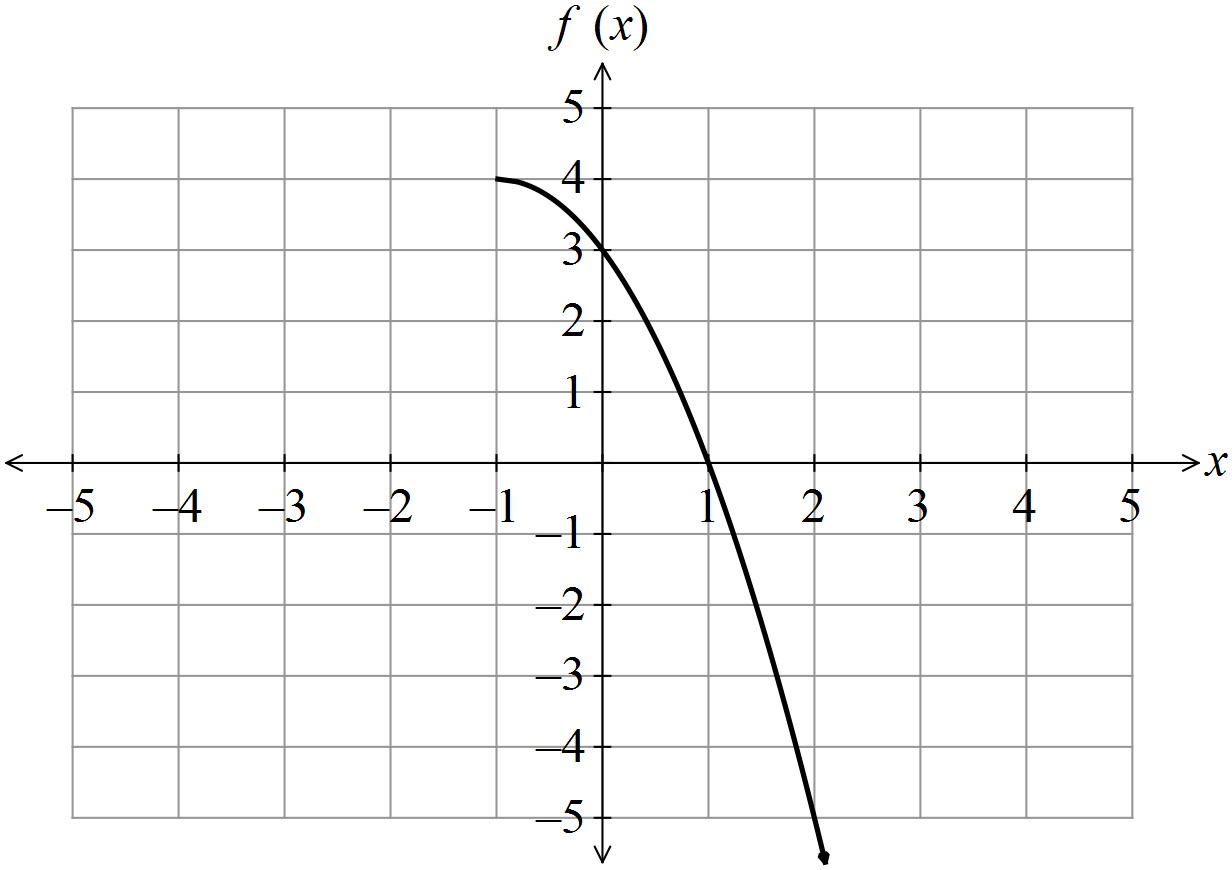
(b)  ✓

 ✓

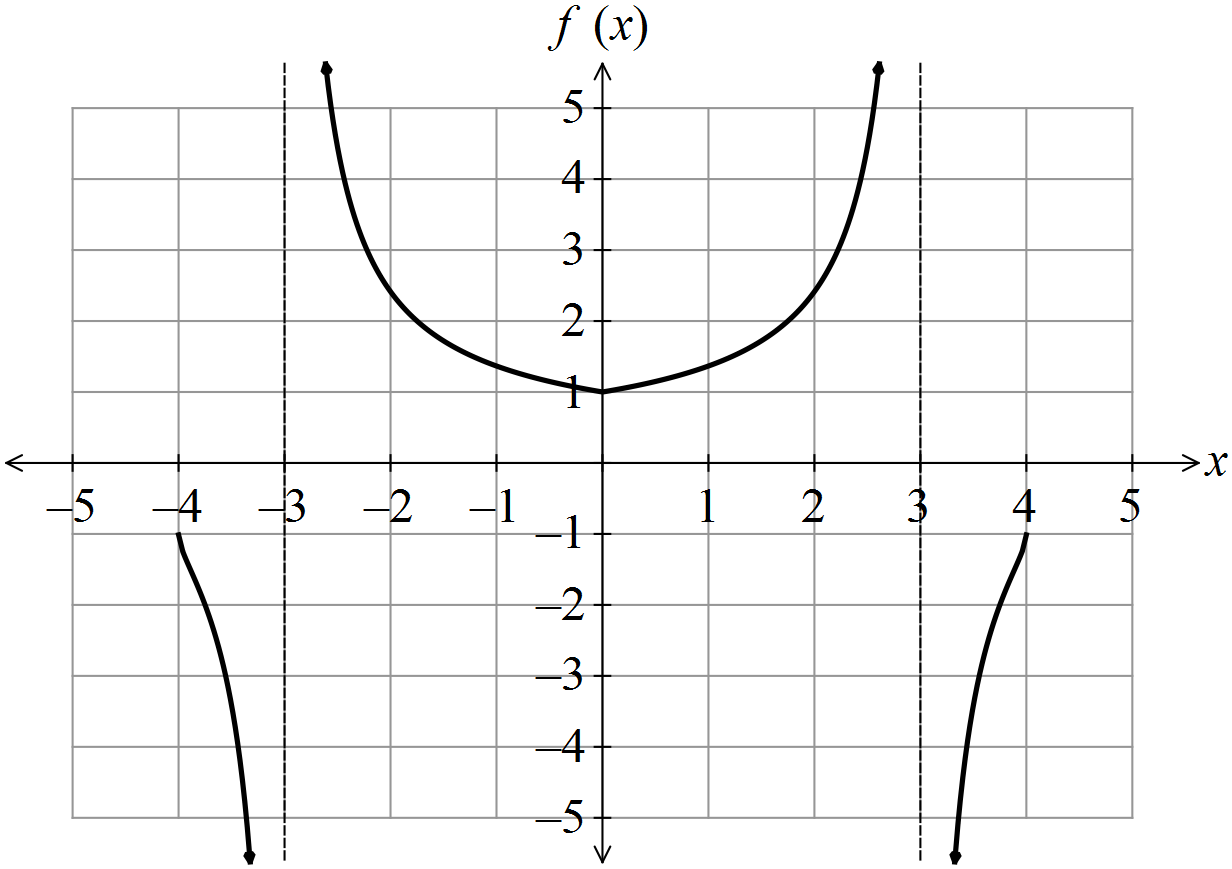
 ✓



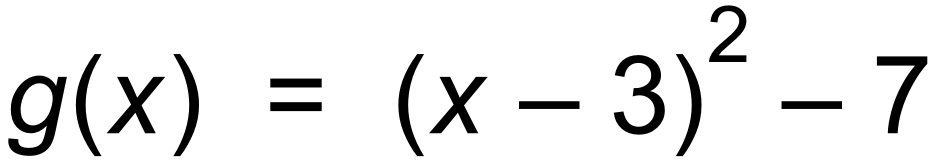
 ✓ [8]

6. (a) (i)

✓

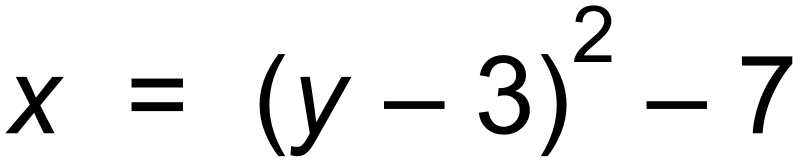
 (ii)

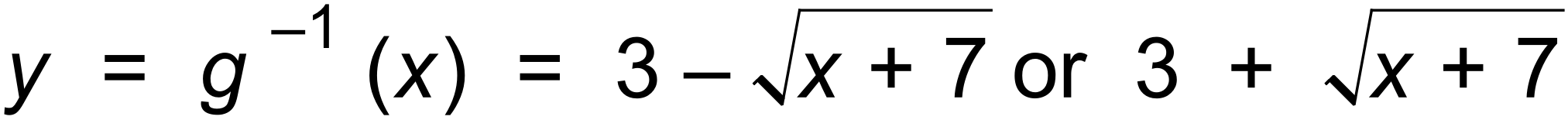
✓✓✓✓

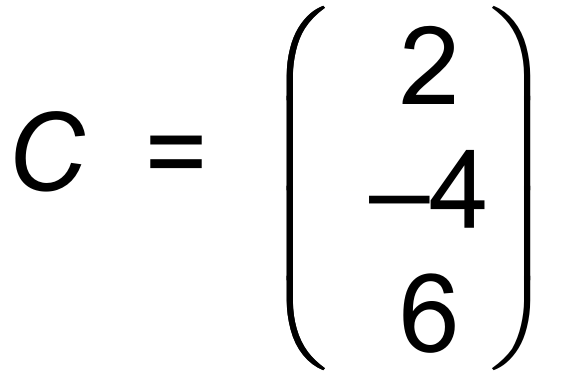
(b)  by completing the square ✓

So domain of *g* (*x*) will be  (max allowable

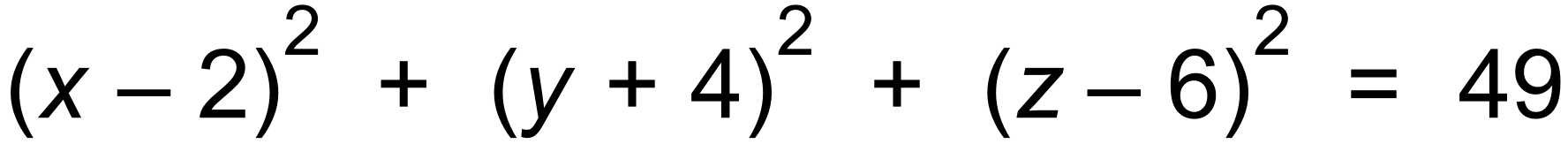
for *g* and to have an inverse)

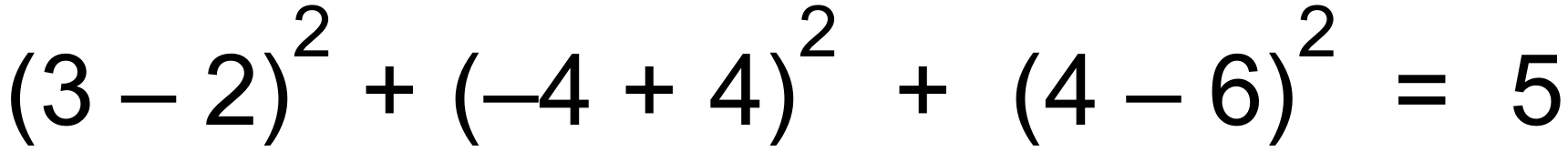
∴  ✓

∴  ✓ [8]

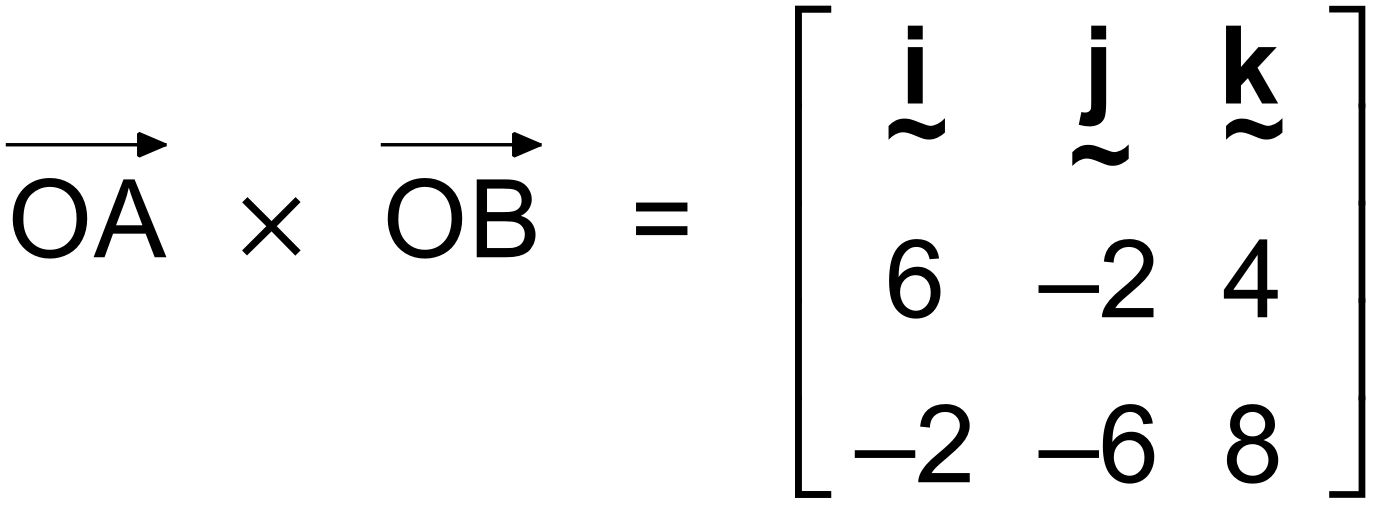
7. (a) (i)  ✓

(ii) A and C ✓

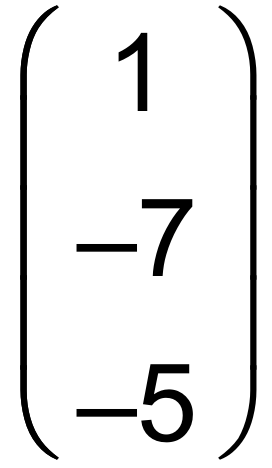
(iii)  ✓

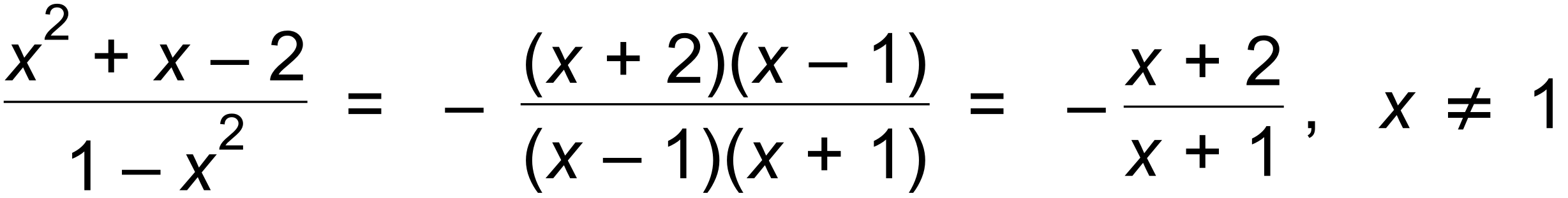
(iv) 

Since < 49, then inside ✓

(b) 

=  ✓✓

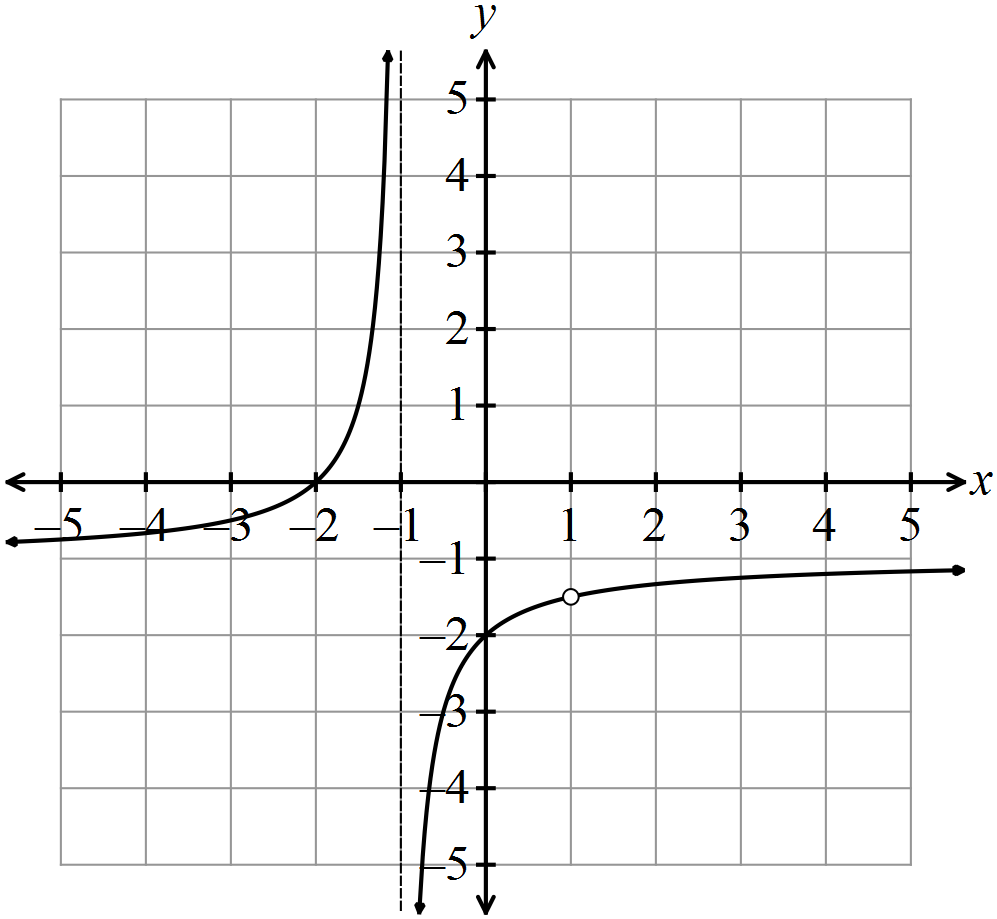
Or any other vector parallel to  [6]

8. (a)  ✓

∴ *x* = −1 is vertical asymptote and *x* = 1, (1, −1.5) is a hole. ✓✓

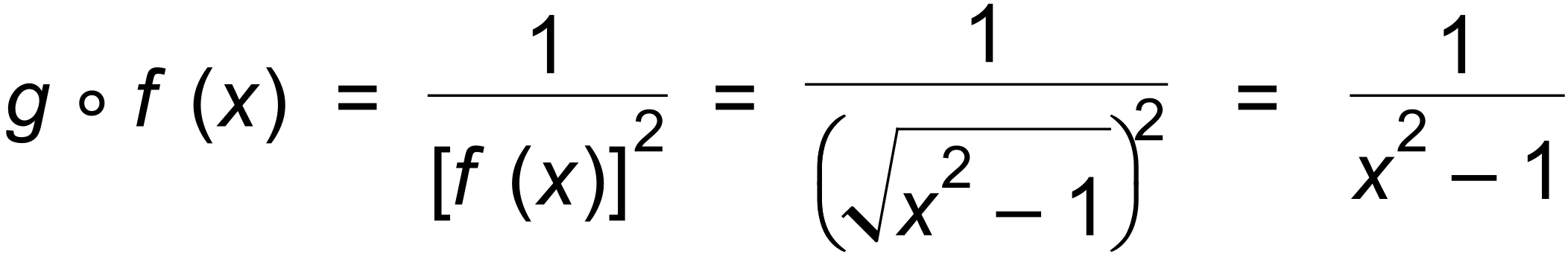
 ✓

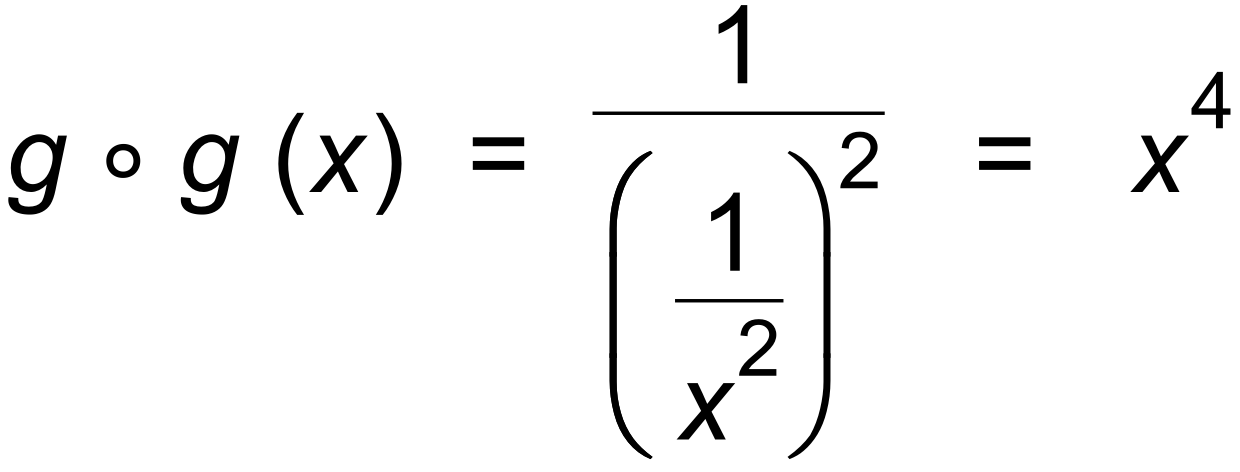
*y*−intercept = −2 and *x*−intercept = −2 ✓

 (b)

✓✓✓ [8]

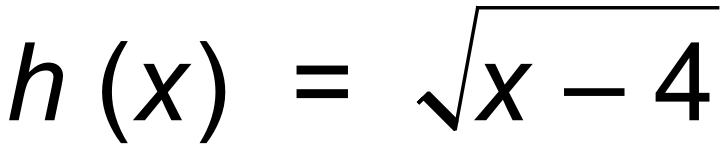
***Calculator−assumed Solutions***

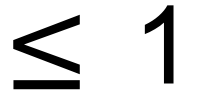
9. (a)  ✓

 ✓

(b) (i)  ✓✓

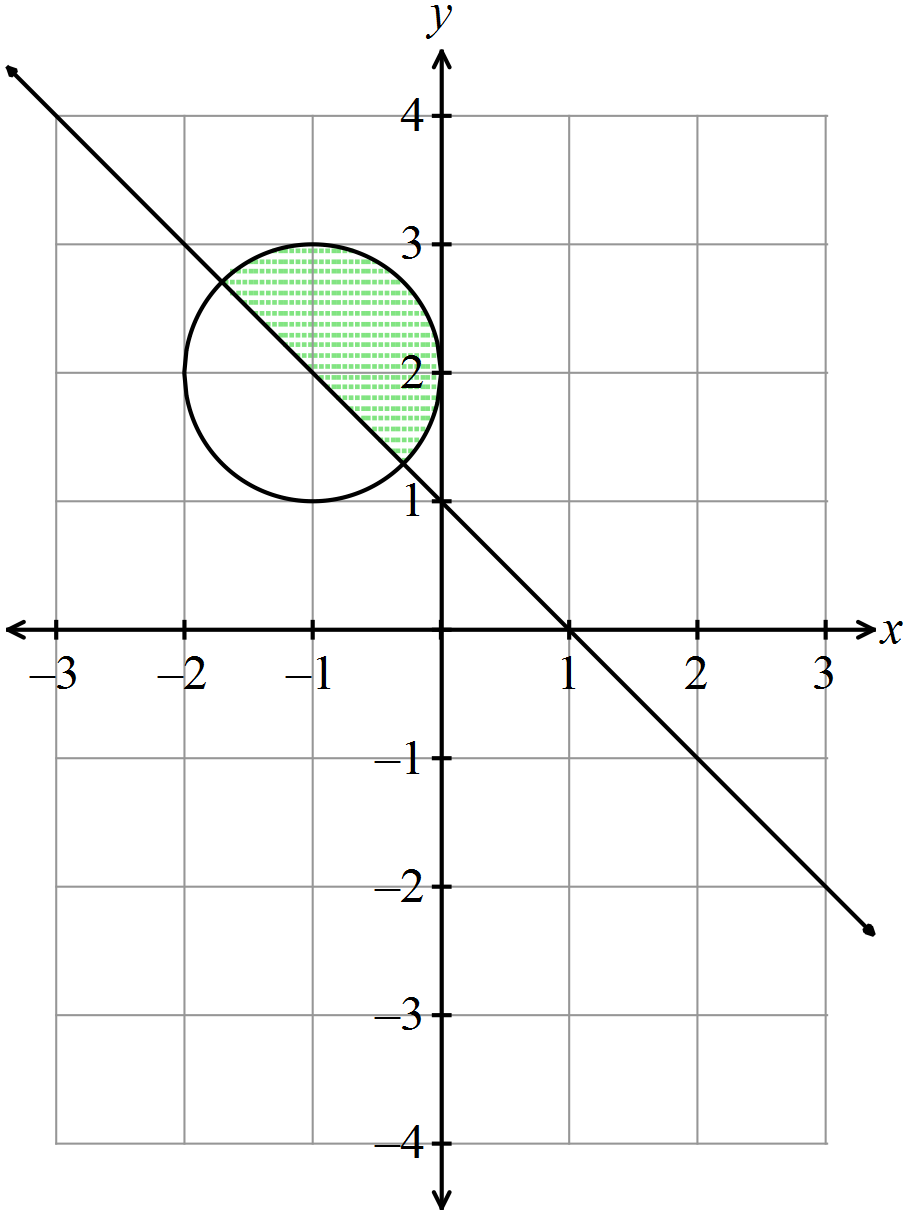
(ii) y > 0 ✓

(c)  ✓ [6]

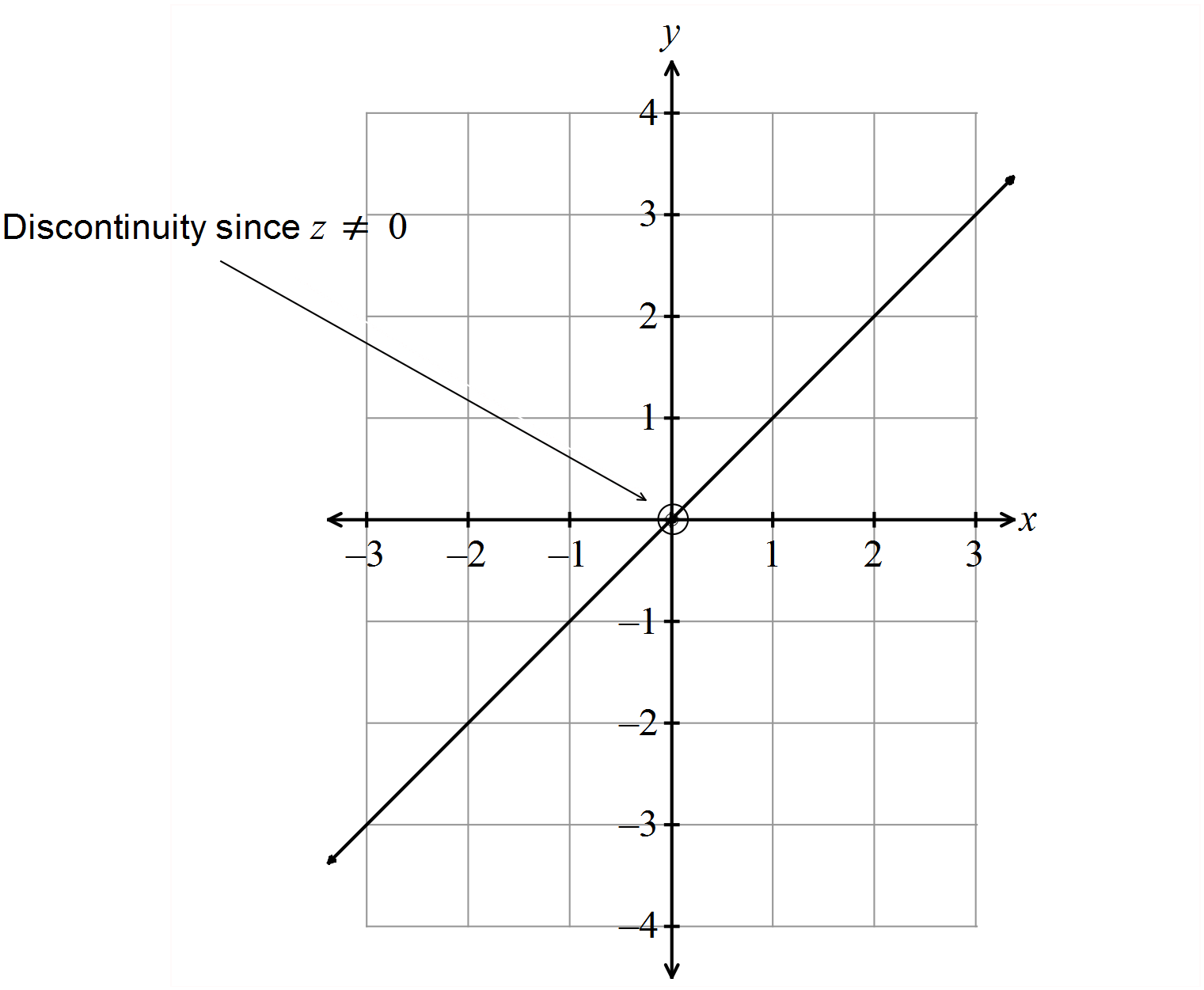
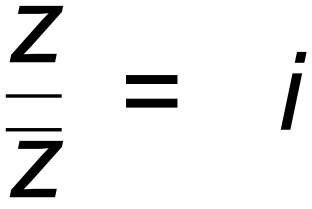
10. (a) | *z* − (−1+2i) |  is the region inside the circle centre (−1, 2) and radius 1

| *z* + i |  | *z* − (2 + i) | is the region on one side of the line *y* = −*x* + 1,

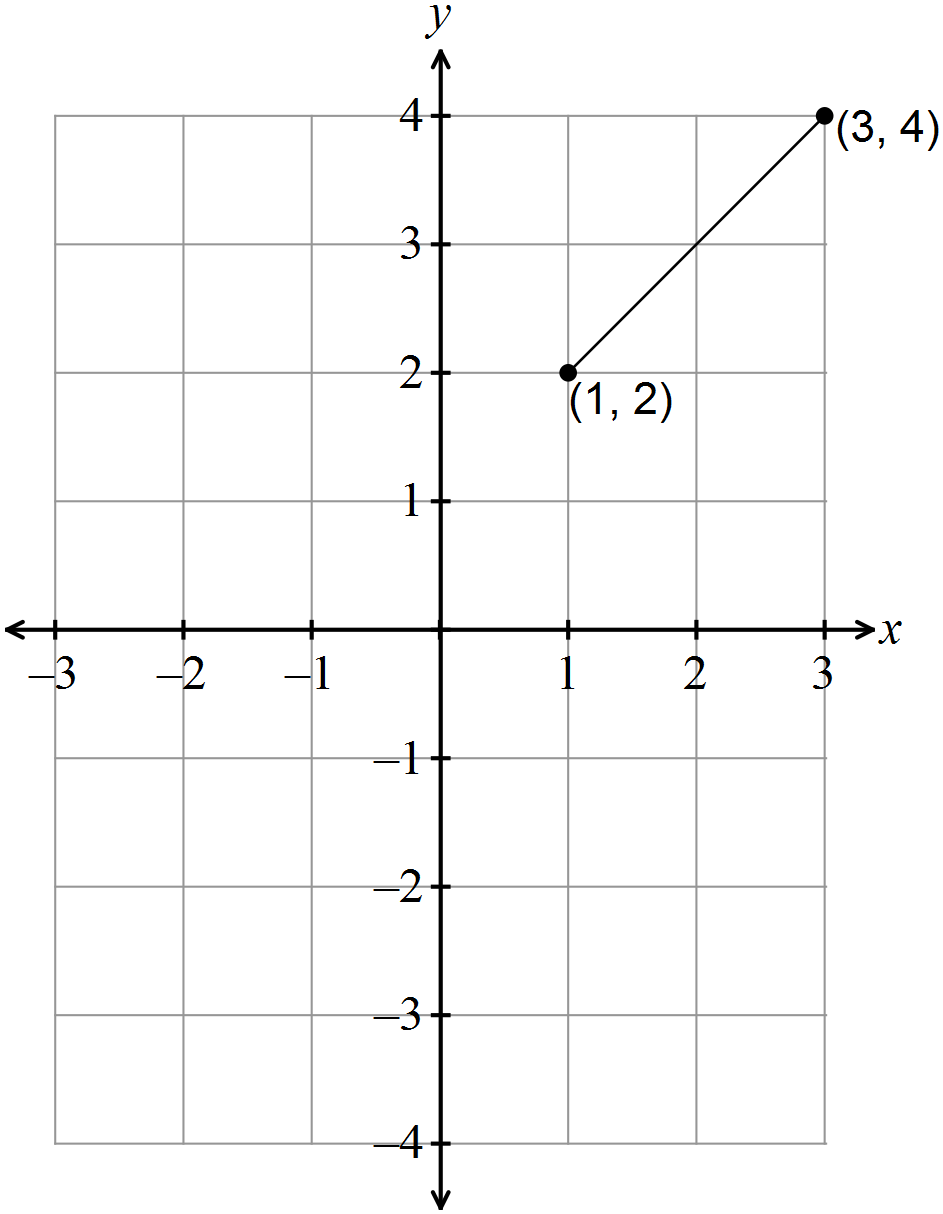
containing (1, 1)



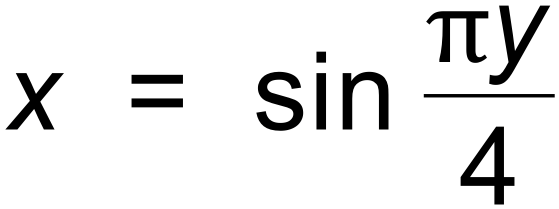
✓✓✓✓

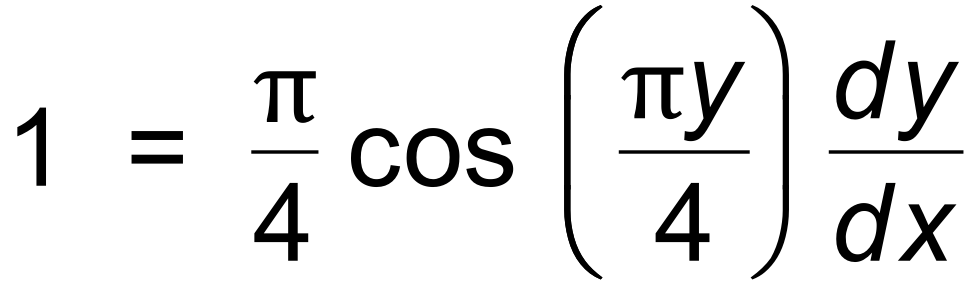
 (b)  is the line *y* = *x*, since *x* + *y*i = i(*x* − *y*i) = *y* + *x*i

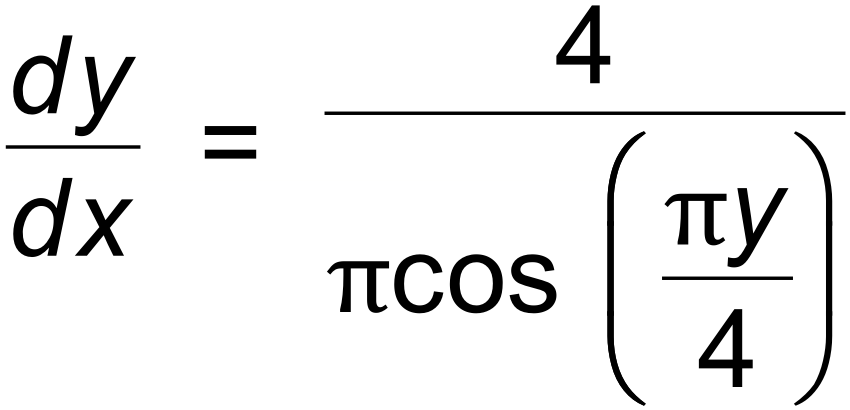
✓✓

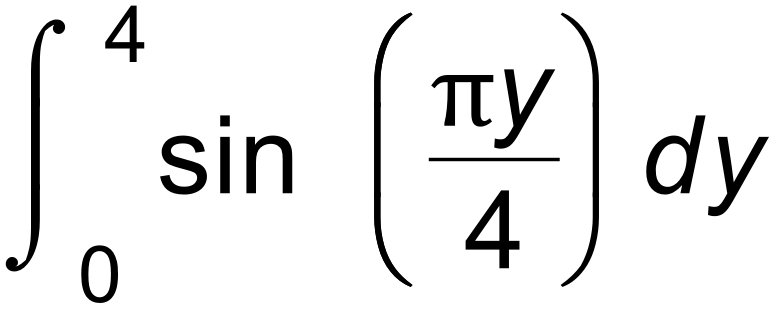
 (c)

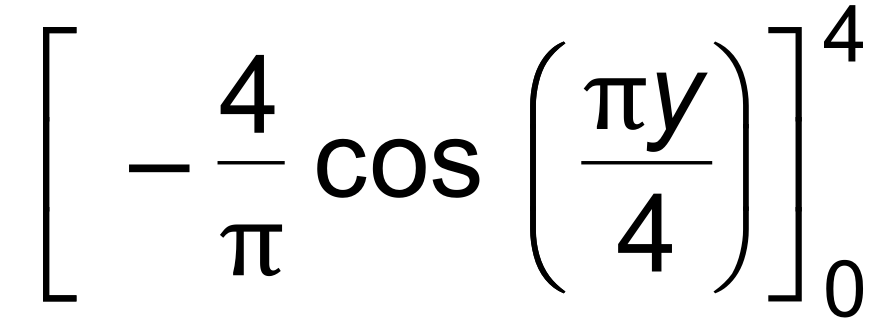
✓✓ [8]

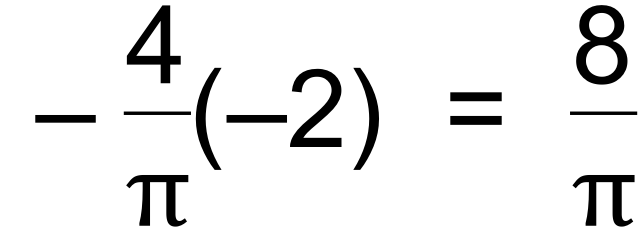
11. (a) 

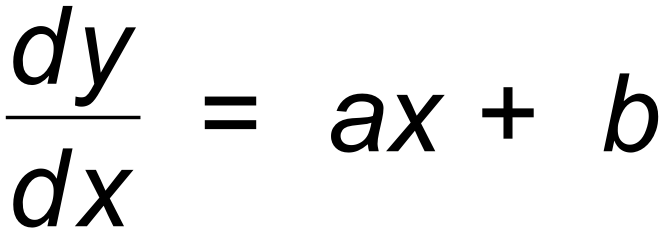
∴  ✓

∴  ✓

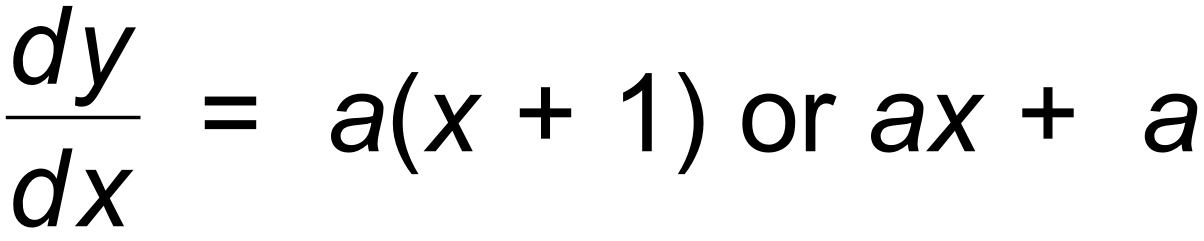
(b)  ✓

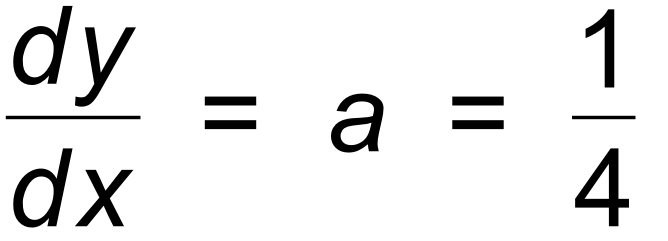
=  ✓

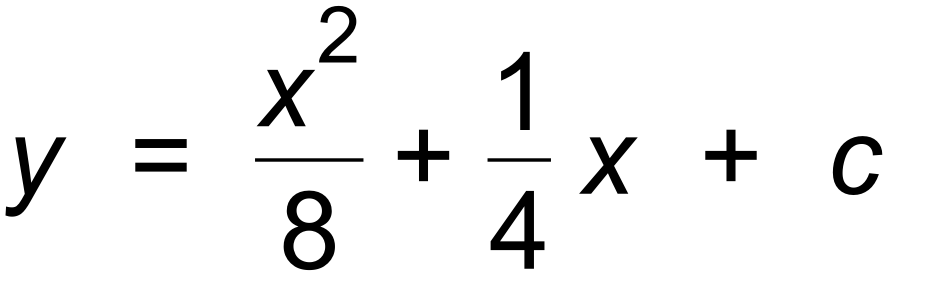
=  ✓ [5]

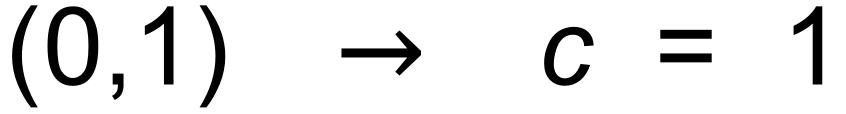
12. (a)  where *a* > 0 ✓

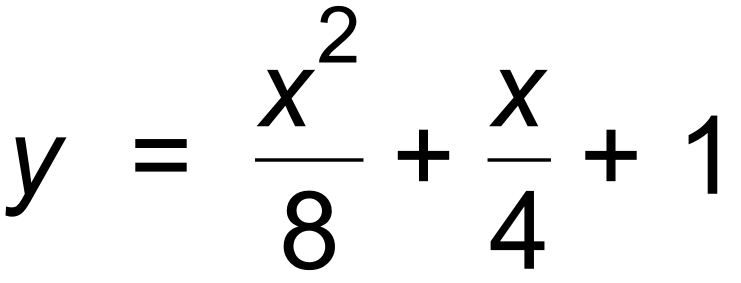
Since  ✓

∴  ✓

(b)  when *x* = 0 ✓

and 

∴  ✓

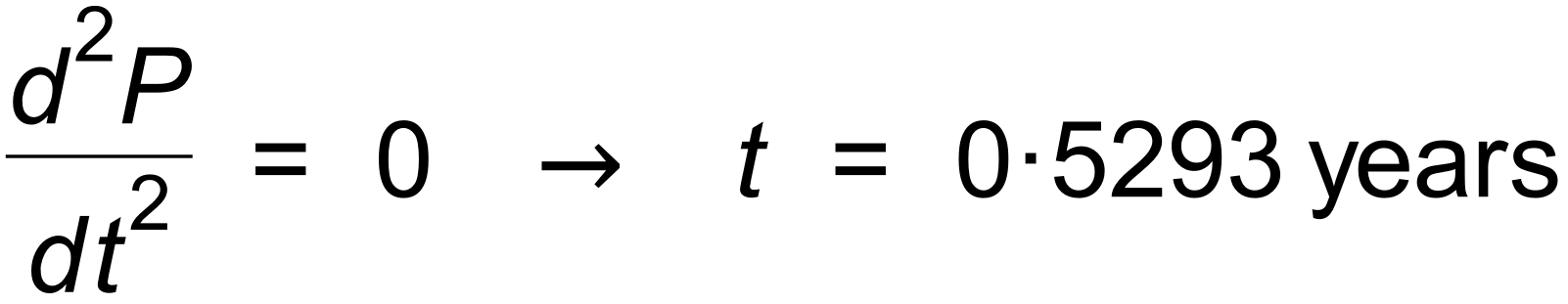
∴  ✓ [6]

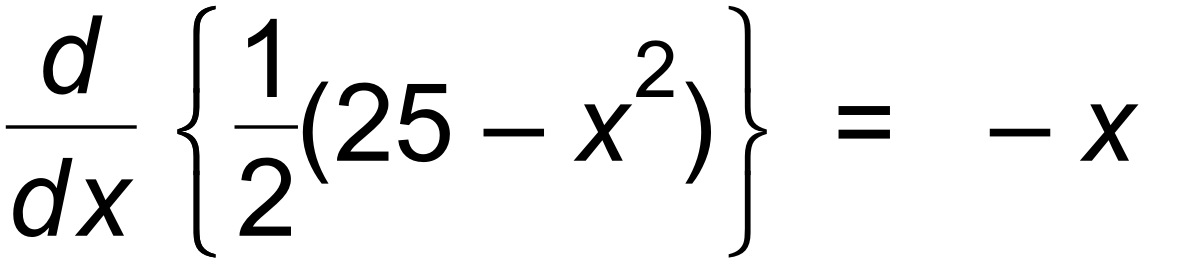
13. (a) 

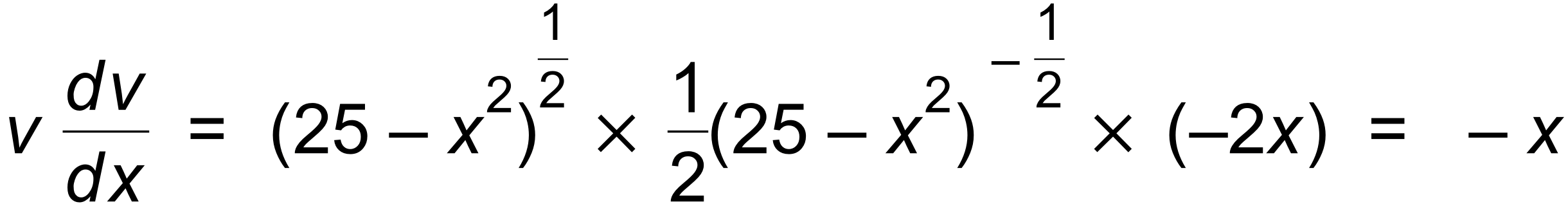
∴ 

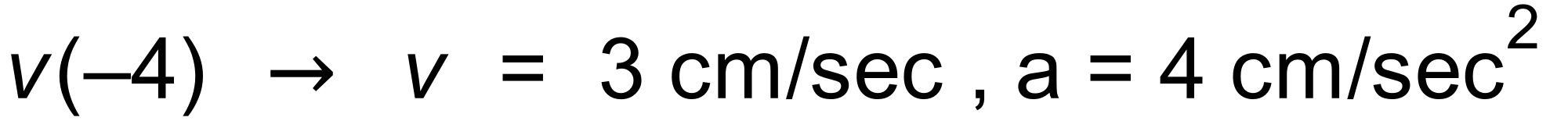
∴ *a* = 2000 and *b* = 199 ✓✓

(b) Increasing at greatest rate at oblique point of inflection.

∴  and *P* = 1000 ✓✓✓ [5]

14. (a)  ✓

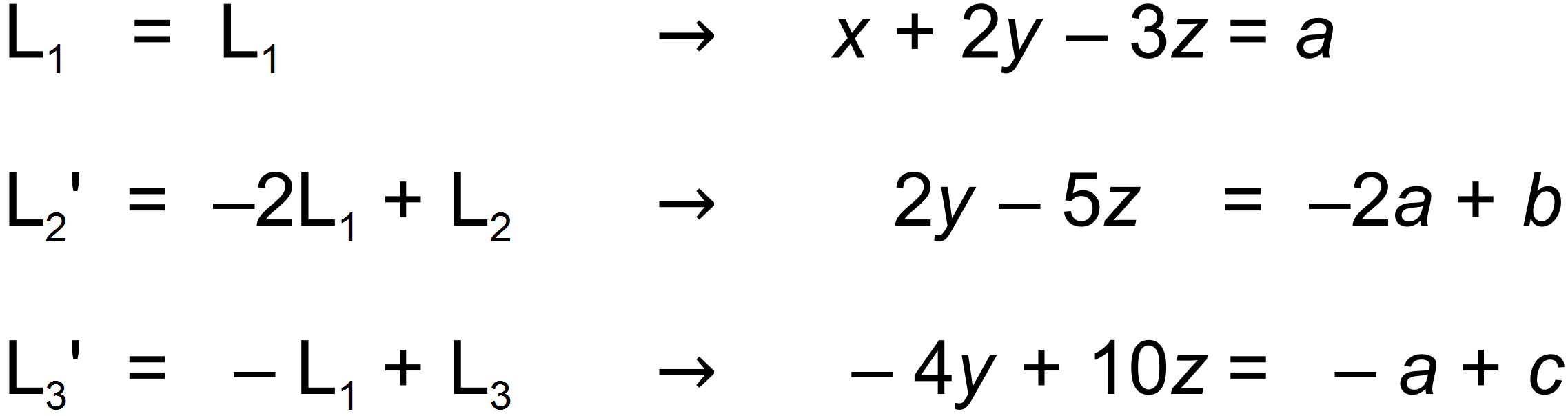
 ✓

(b)  ✓✓

(c) 

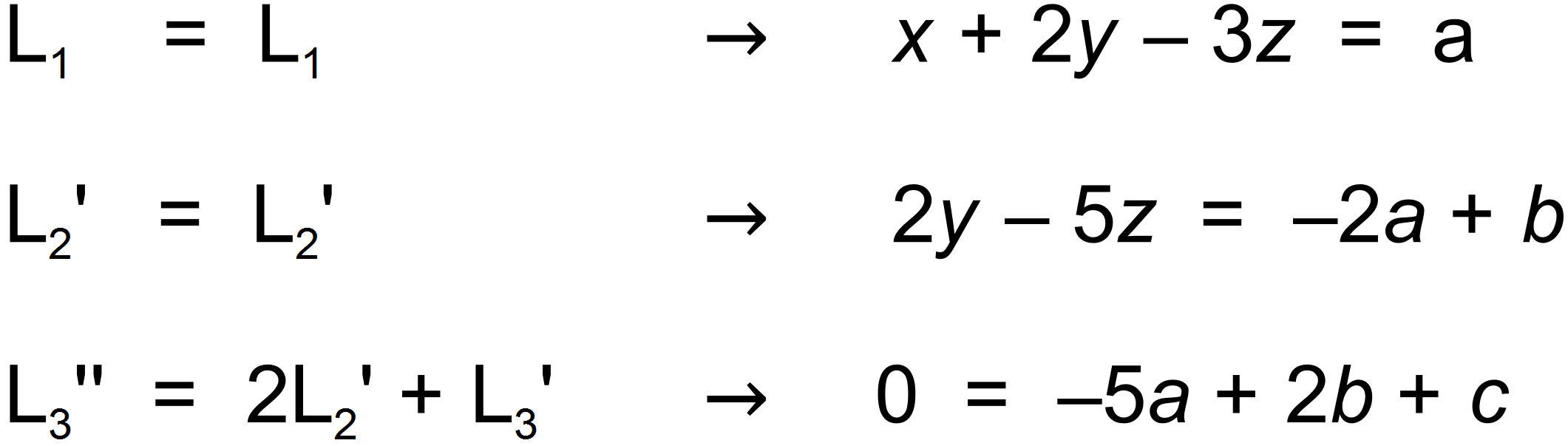
 ✓✓

(d)  ✓✓ [8]

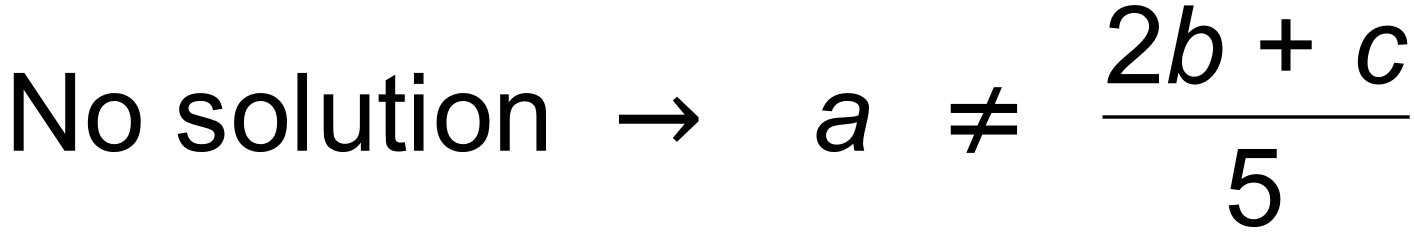
15. 

✓

and then

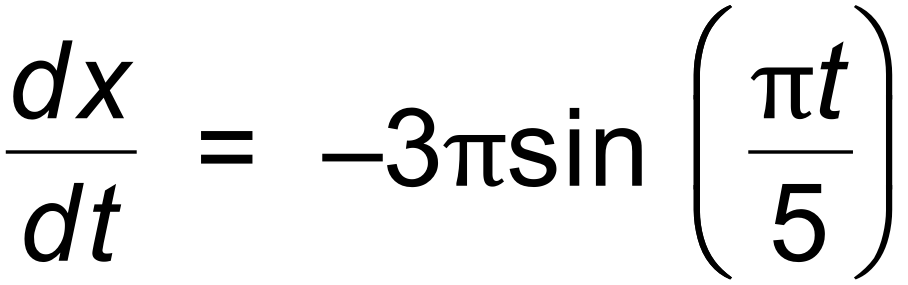


✓

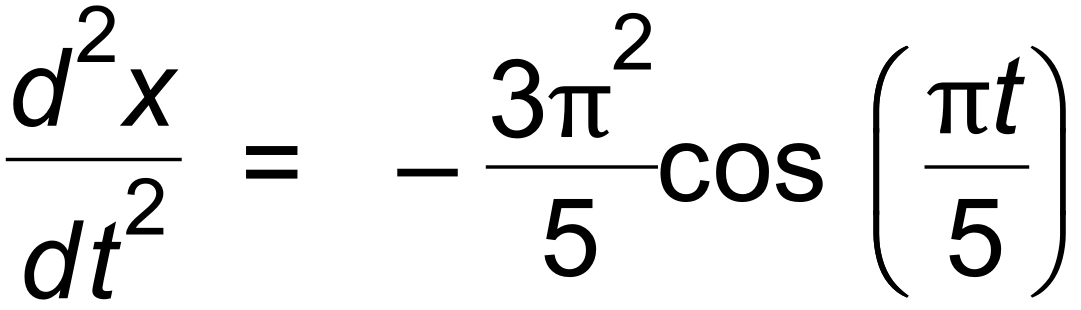
 ✓✓ [4]

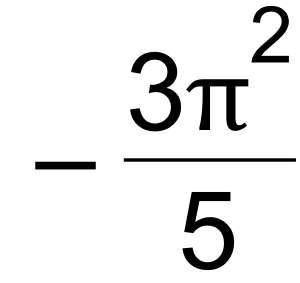
16. (a) 

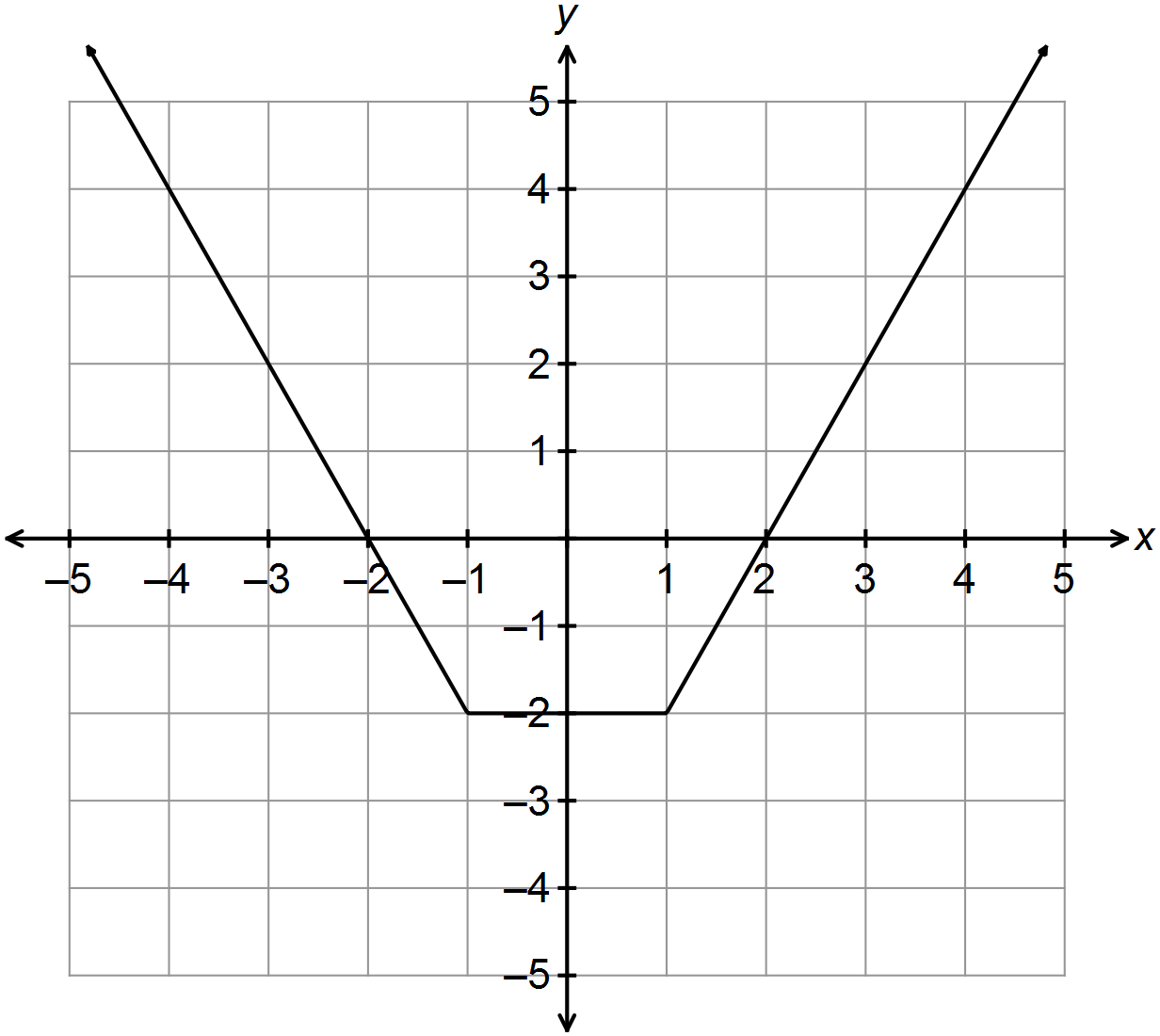
∴  ✓✓

and 

∴ Max speed = 3 m/sec ✓

(b) 

∴ Min acceleration =  m/sec2 is at *x* = 15 m ✓✓ [5]

17. (a)

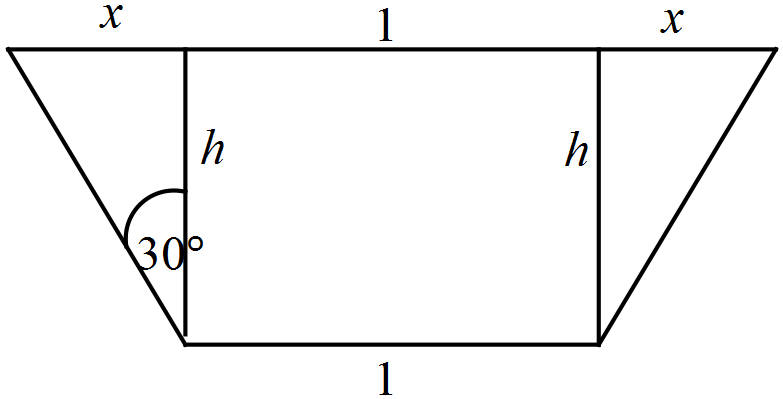
✓

(b) *a* = 1 ✓

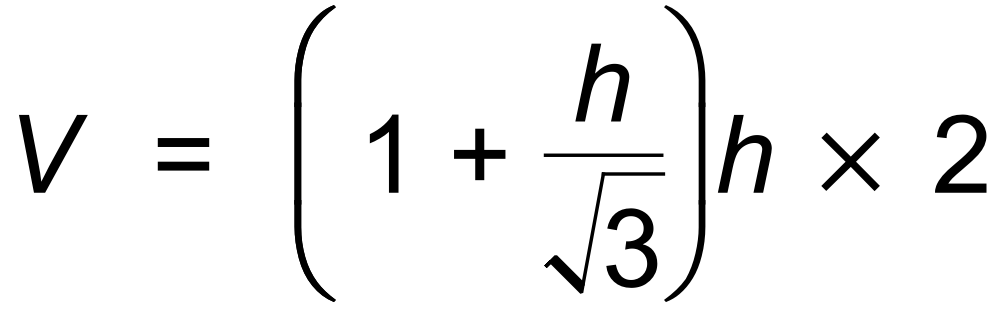
*b* = 2 (or −2) ✓

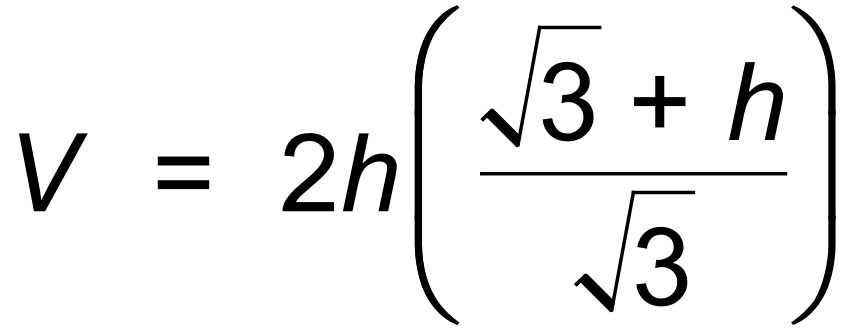
*h*(0) = 4 − *c* = −2 ∴ *c* = 6 ✓

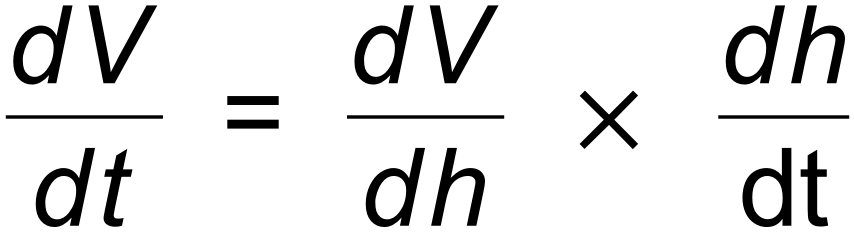
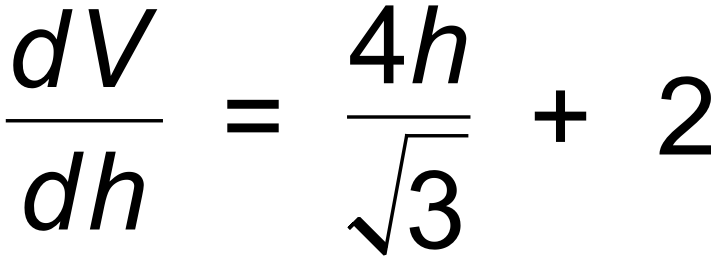
(c) *d* > −6 ✓✓ [6]

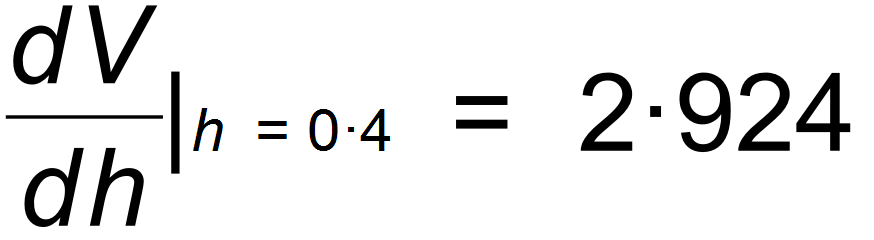
18. (a)

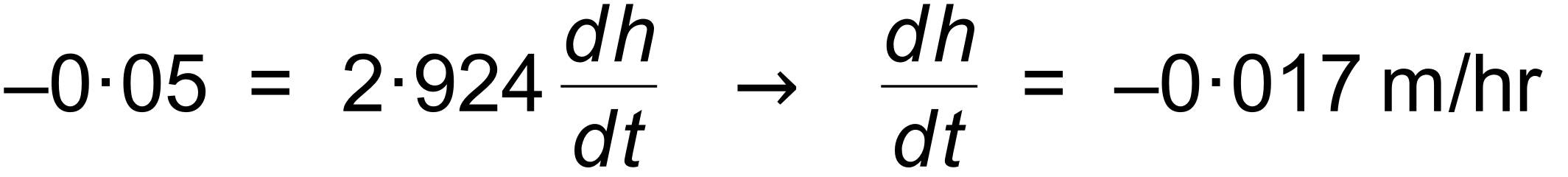
 ✓

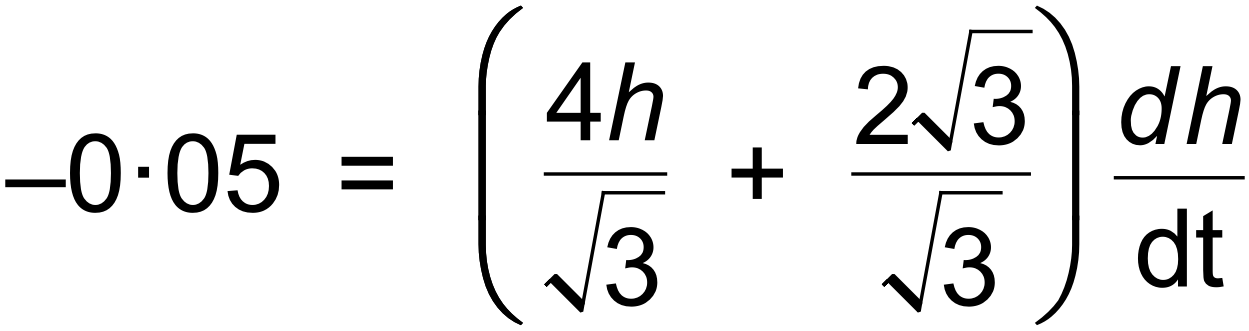
∴  ✓

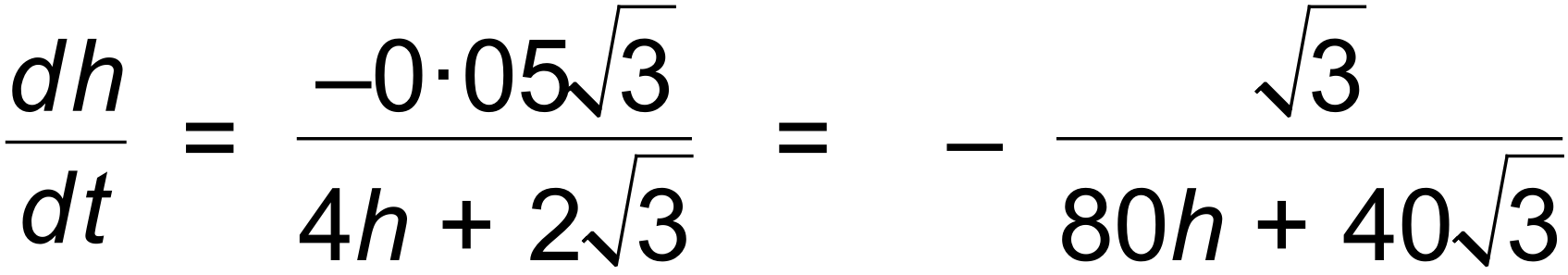
∴  ✓

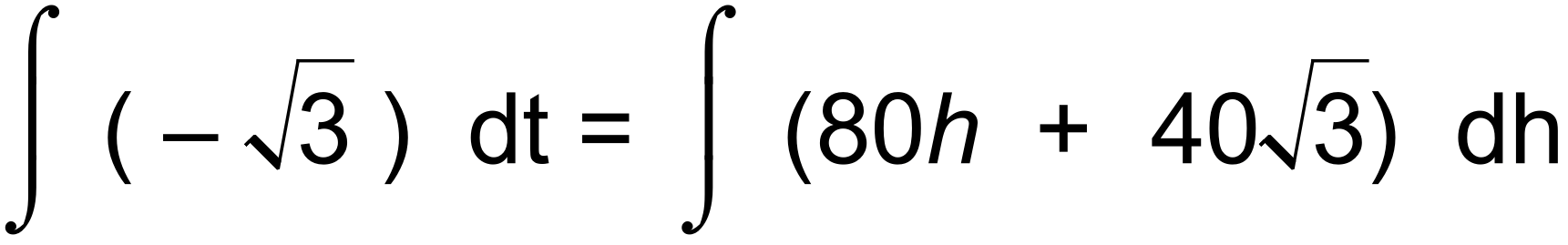
(b)  and  ✓

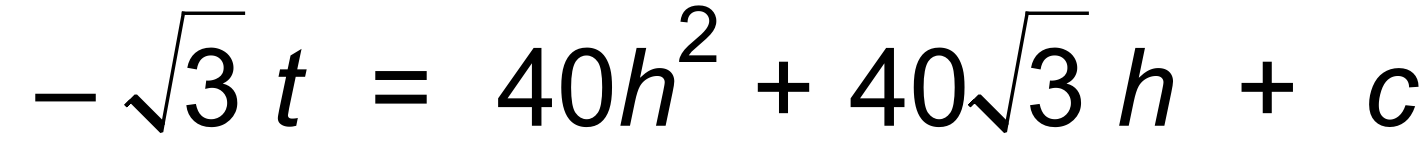
 ✓

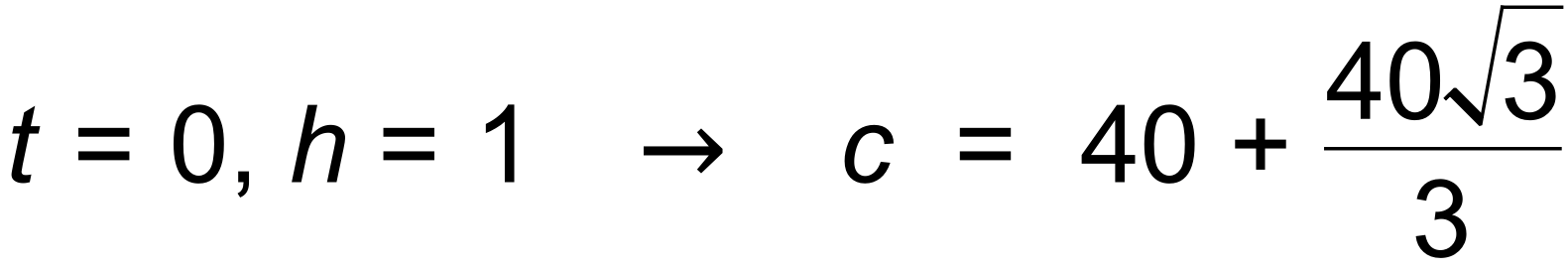
∴  ✓

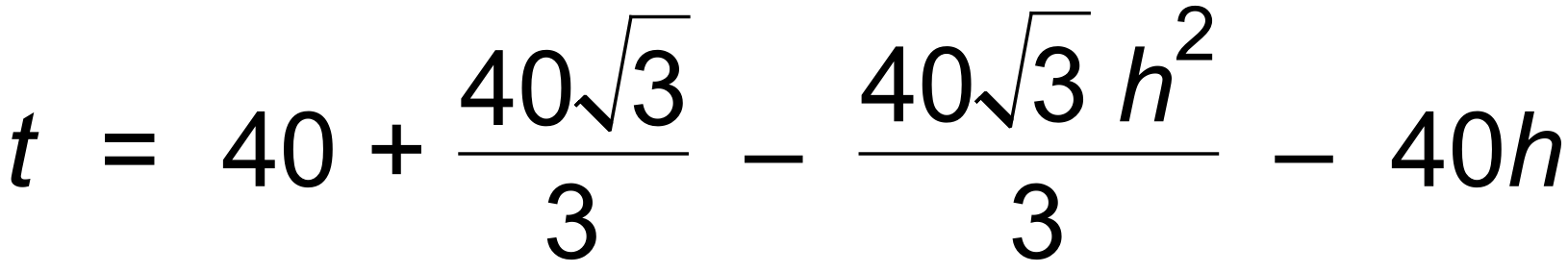
(c)  ✓

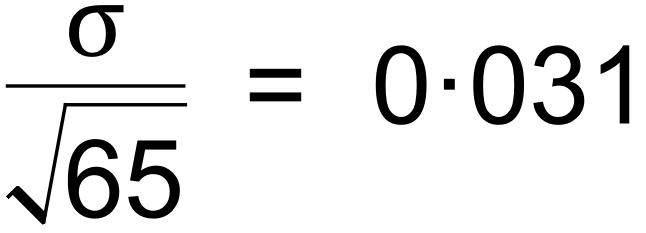
∴  ✓

(d) 

∴  ✓

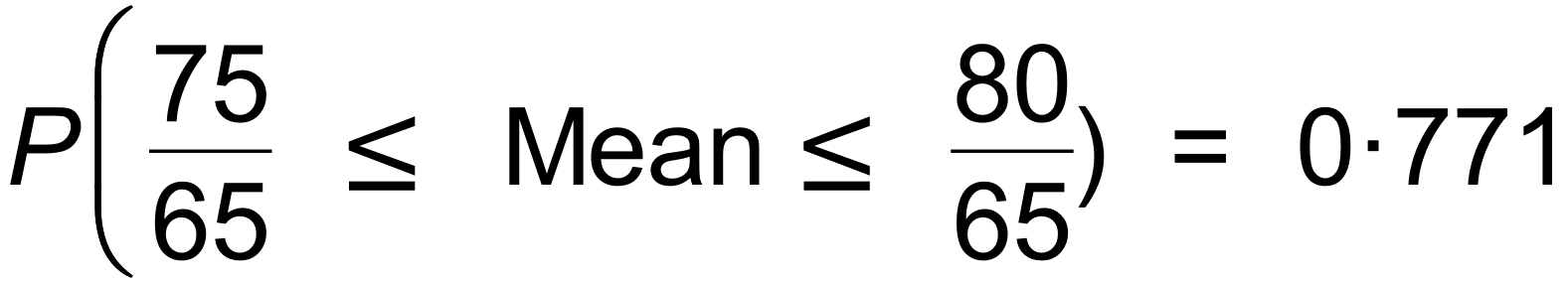
Since  ✓

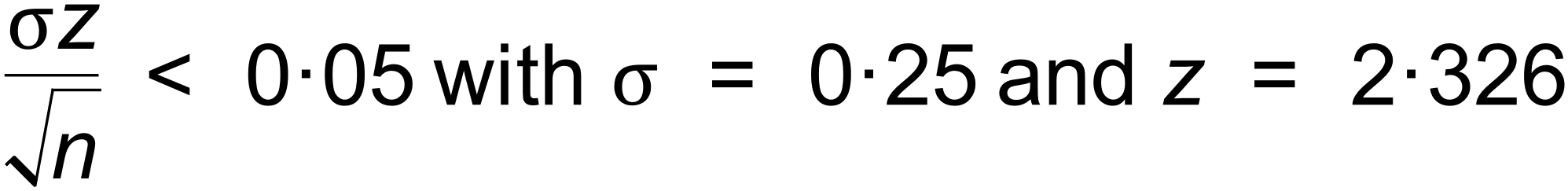
∴  ✓ [11]

19. (a) (i)  ✓

∴  ✓✓

(ii)  ✓

∴  ✓✓

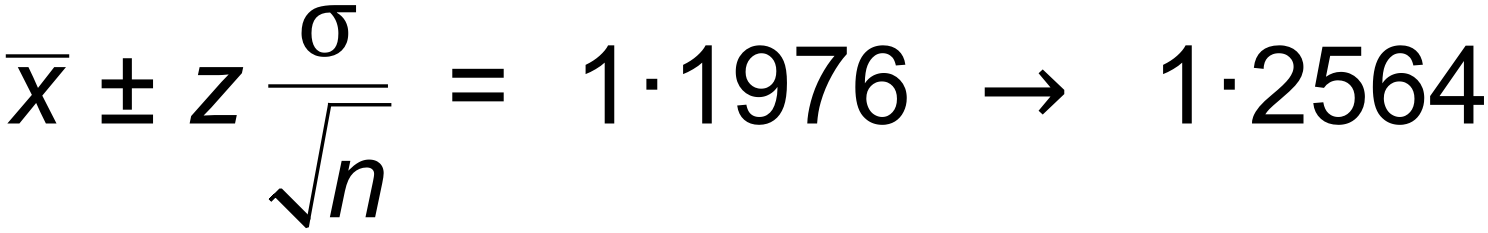
(b) 

∴  ✓

∴ Need to catch 136 fish. ✓

(c) 



 ✓✓

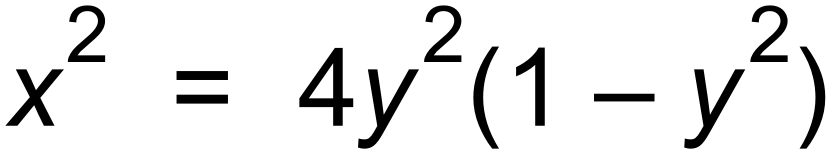
∴  ✓

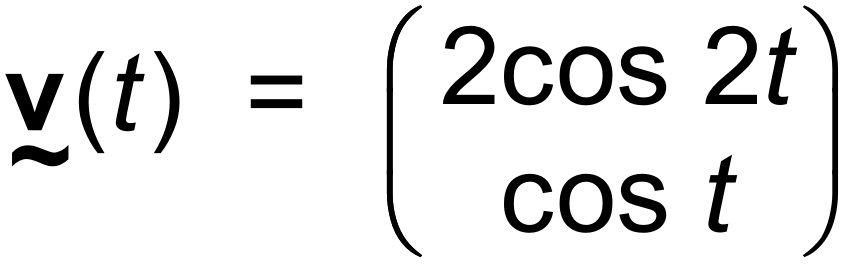
∴ Cannot conclude that crayfish in James’ area are

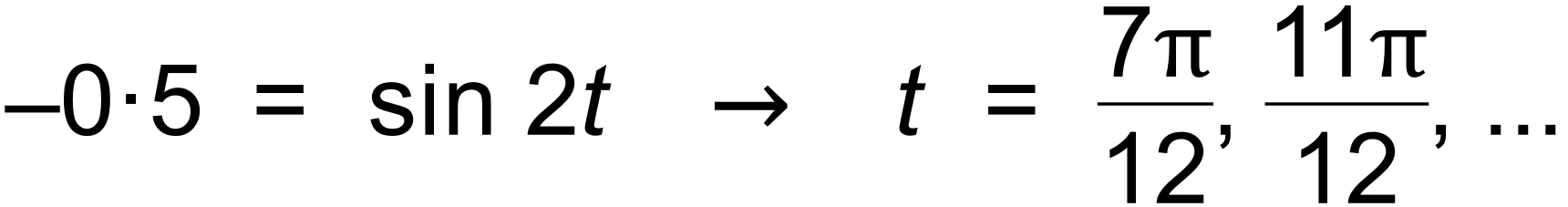
significantly bigger ✓ [12]

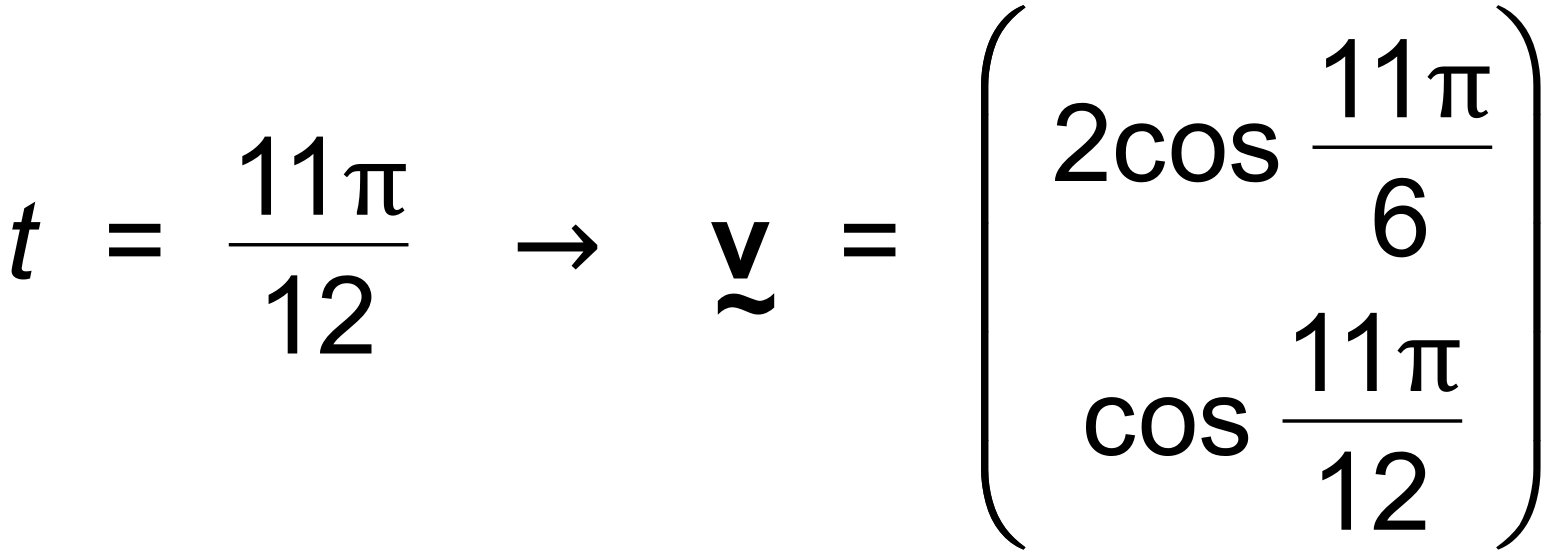
20. (a) 

∴  ✓

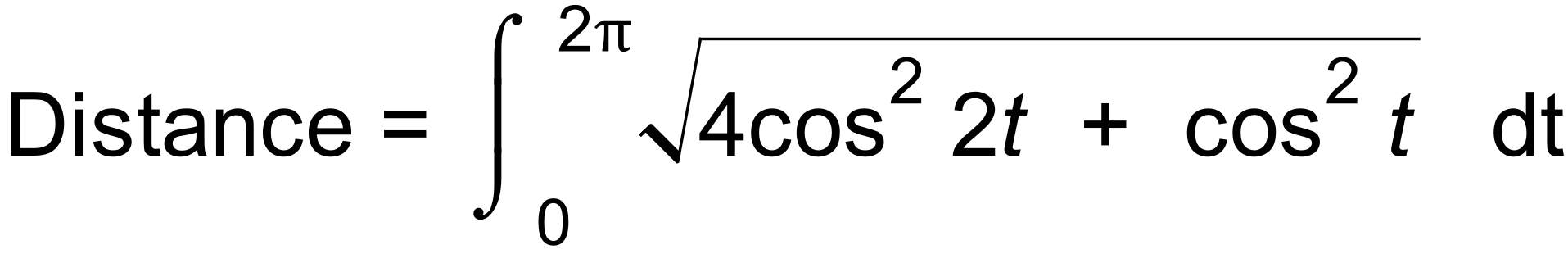
∴  ✓

(b) 

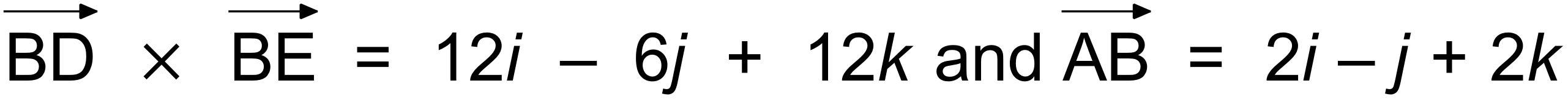
∴  ✓✓

 ✓

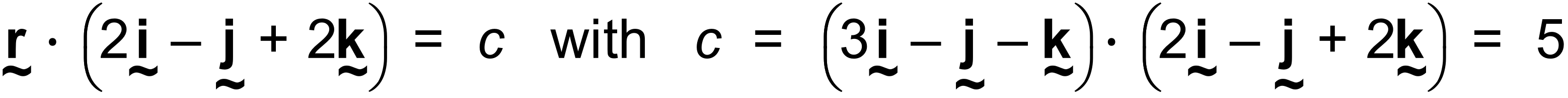
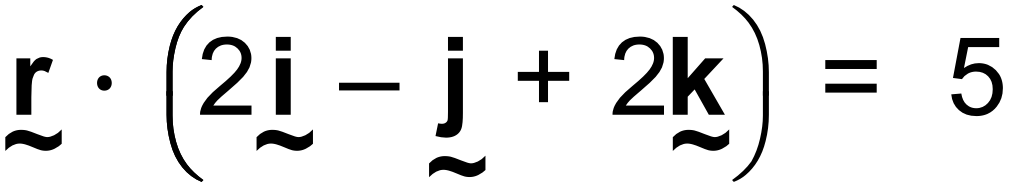
∴ Speed = 1.98 m/sec ✓

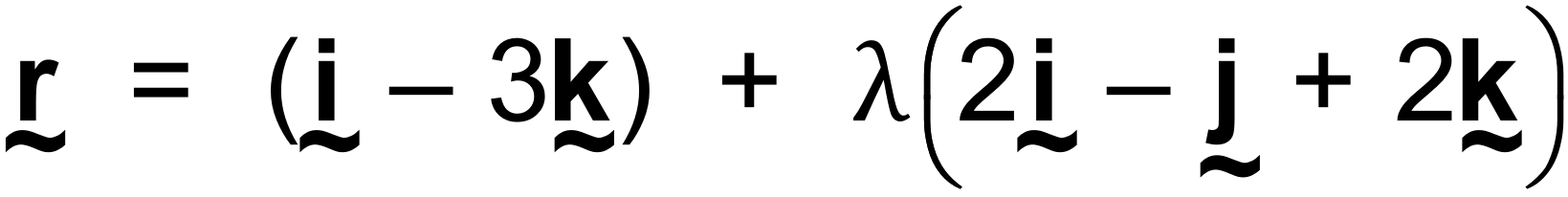
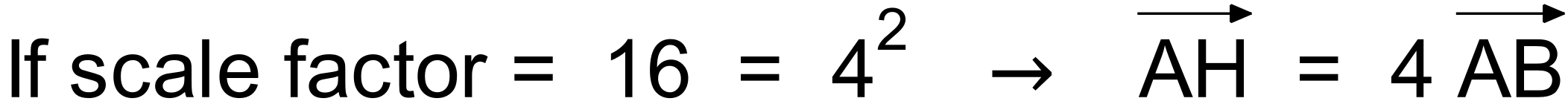
(c)  ✓✓

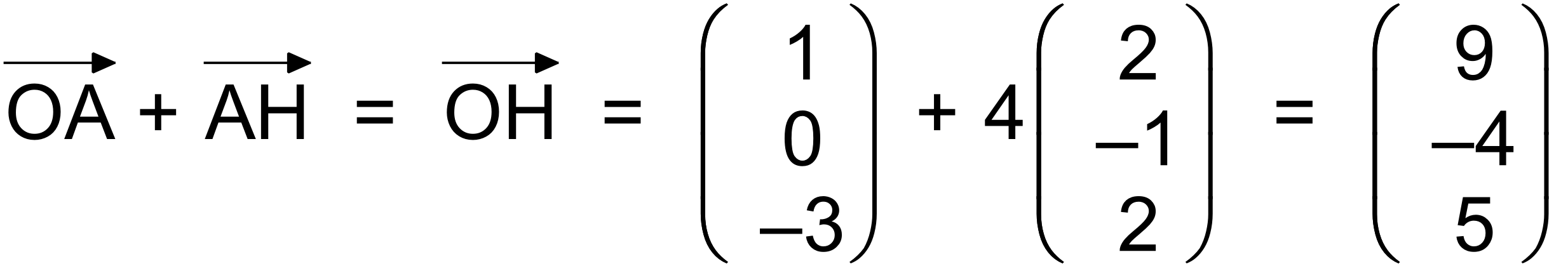
= 9.43 m ✓ [9]

21. (a) 

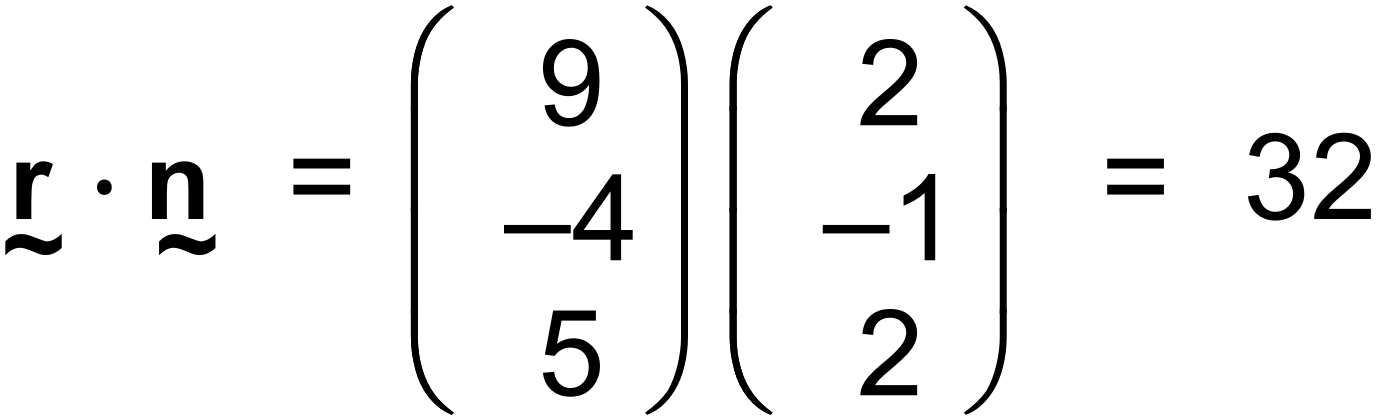
∴ *k* = 6 ✓✓

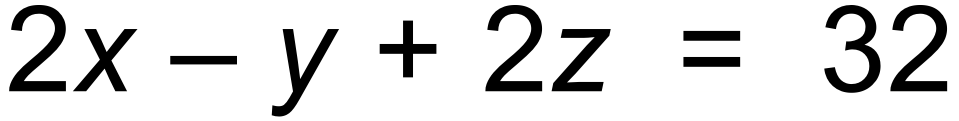
(b)  ✓  ✓

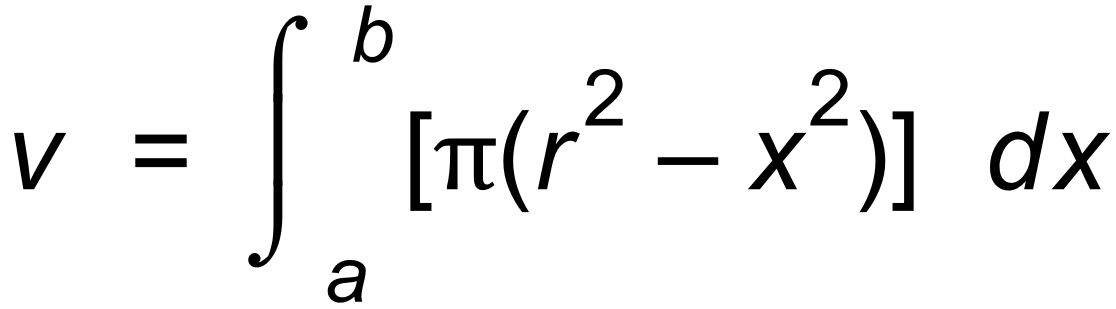
(c)  ✓ (d)  The distance from A to each triangle has a scale of 1:3 ✓ ∴  ✓ (e)  ✓

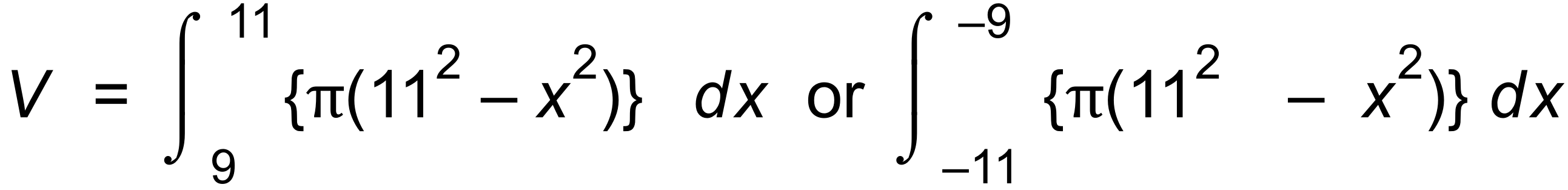
 ✓



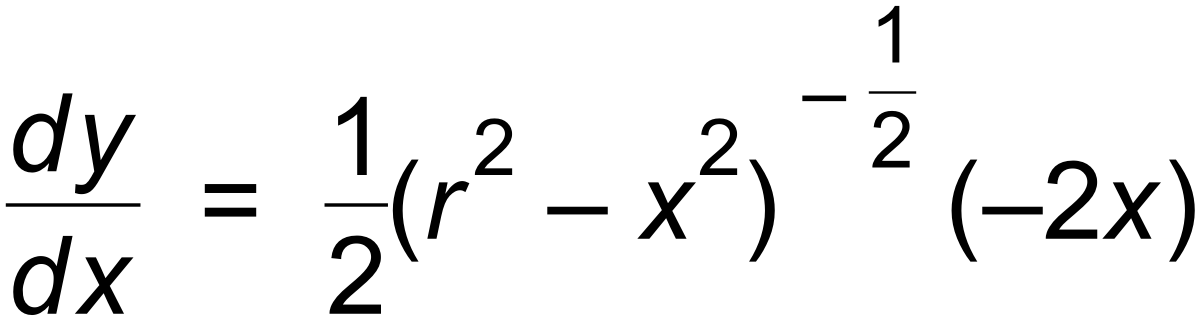
∴ 

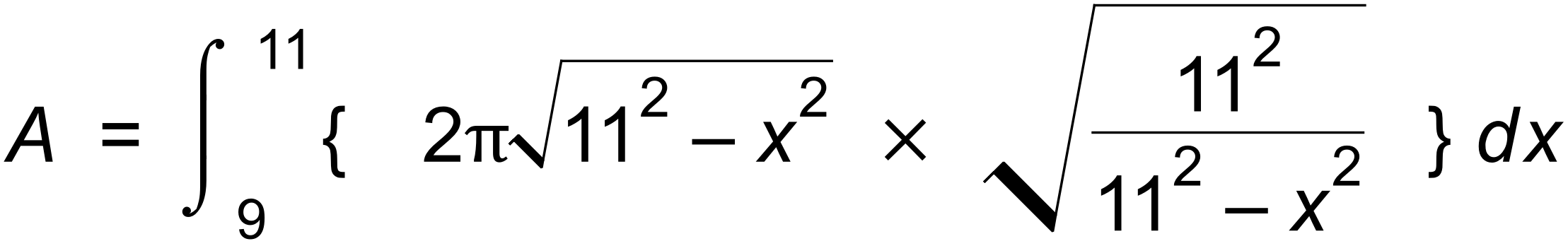
∴  ✓ [10]

22. (a)  ✓

(b)  ✓

=  ✓

(c)  ✓

∴  ✓ [5]