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**SEMESTER TWO**

**MATHEMATICS**

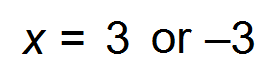
**METHODS**

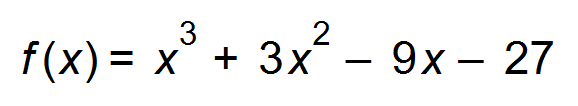
**UNITS 1 and 2**

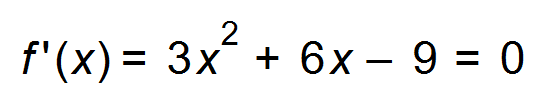
**2020**

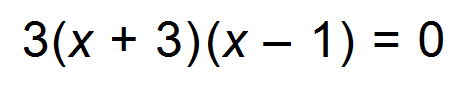
**SOLUTIONS**

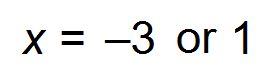
**Calculator−free Solutions**

1. (a)  ✓✓

(b) 

 ✓

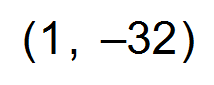


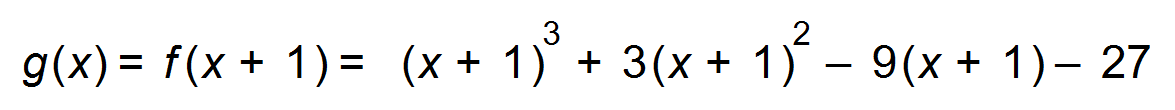
 ✓

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *x* |  |  |  |  |  |
| *f*(*x*) | ↑ | - | ↓ | - | ↑ |
| *f ’*(*x*) | + | 0 | - | 0 | + |

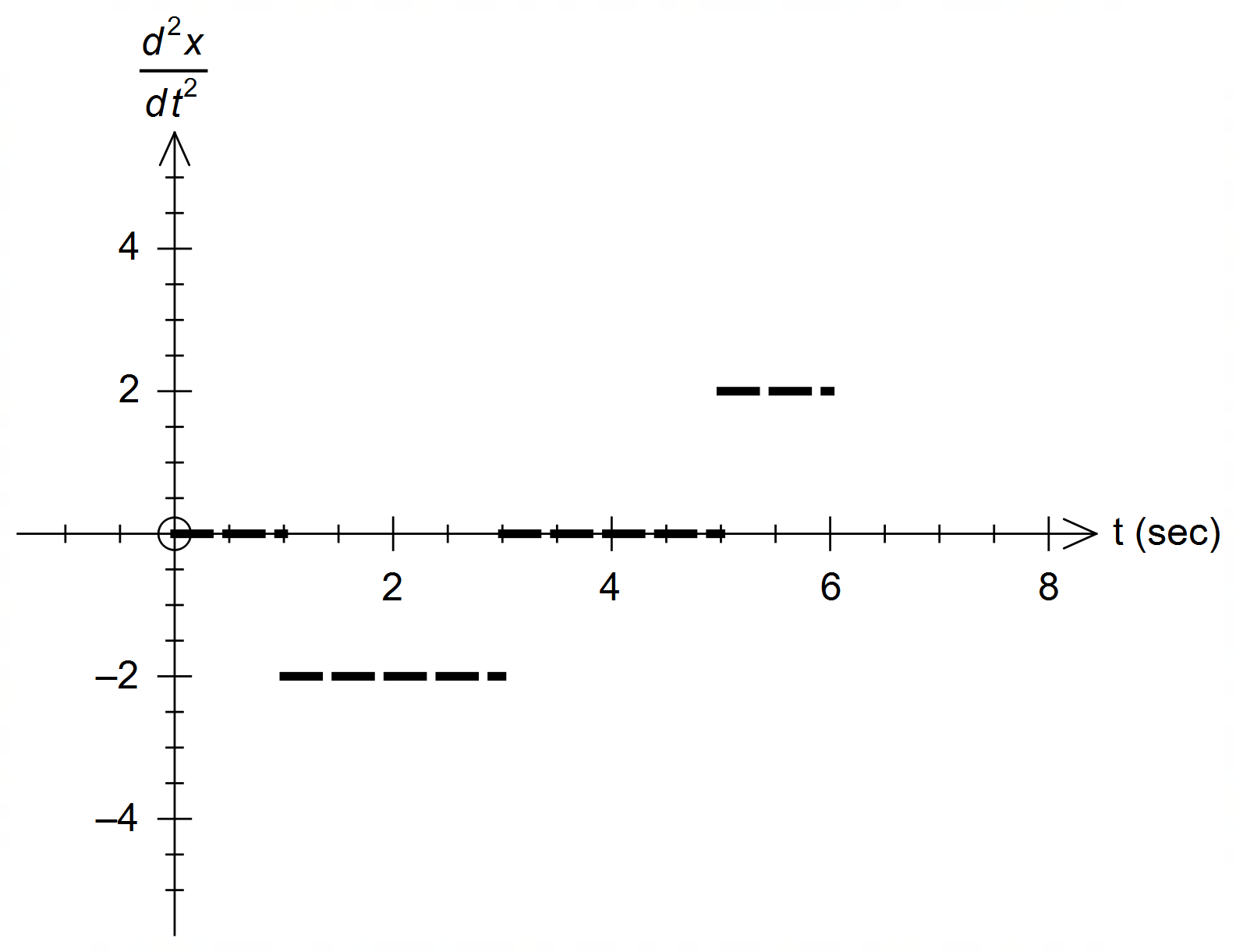
✓

(- 3, 0) Maximum ✓

 Minimum ✓

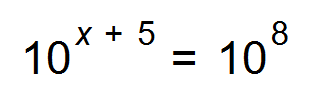
(c)  ✓ [8]

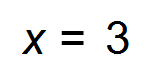
2. (a) 0 < *t* < 1 or 3 < *t* < 5 ✓✓

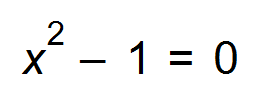
 (b) 6 seconds (<0) 2 seconds (>0) ✓

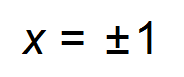
(c)

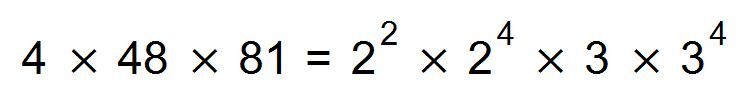
✓✓ [5]

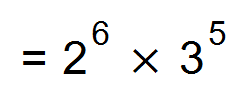
3. (a) (i) 

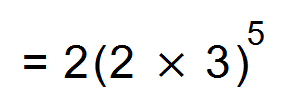
** ✓

(ii)  ✓

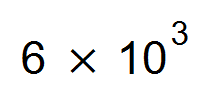
 ✓

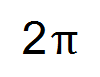
(b)  ✓

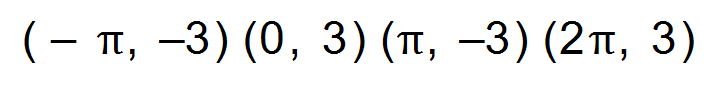


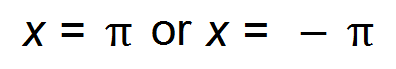
 ✓

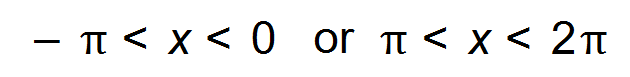
*k* = 5 ✓

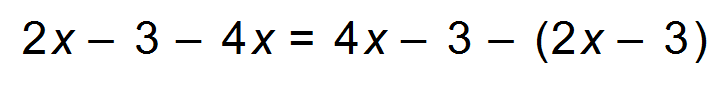
(c)  ✓✓ [8]

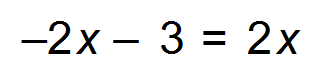
4. (a)  ✓

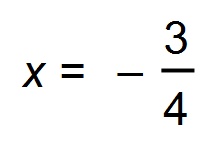
(b)  ✓✓

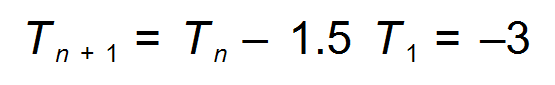
(c)  ✓

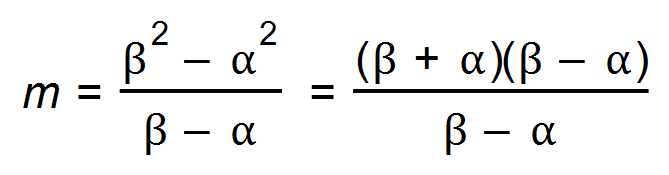
(d)  ✓✓ [6]

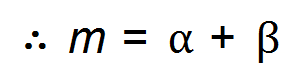
5. (a)  ✓

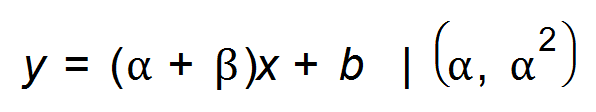


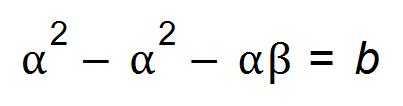
 ✓

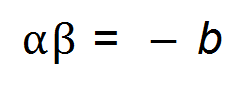
(b)  ✓✓ [4]

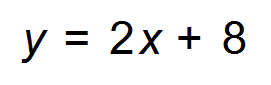
6. (a)  ✓✓

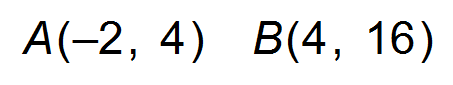


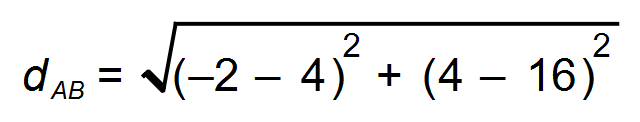
 ✓

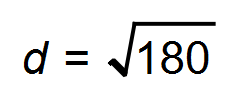
 ✓

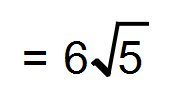


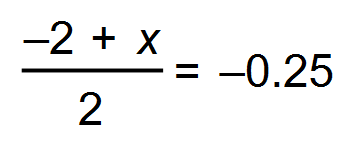
(b) (i)  ✓

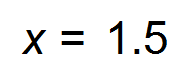
(ii)  ✓

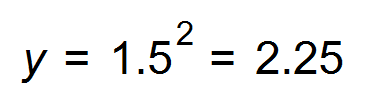
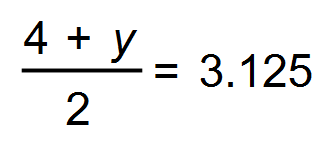


 ✓

 units

(iii) 

 ✓

 (or  *y* = 2.25) ✓ [9]

|  |  |  |  |
| --- | --- | --- | --- |
|  | Location A | Location B | Totals |
| Buses left late | 15 | **40** | 55 |
| Buses left on time | **25** | 20 | **45** |
| Totals | 40 | **60** | 100 |

7. (a)

✓✓

(b) (i) The events are whether a bus leaves from Location A or not

and whether a bus left late or not. ✓

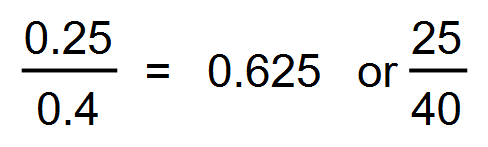
(ii) Probability of leaving from Location A = 0.4

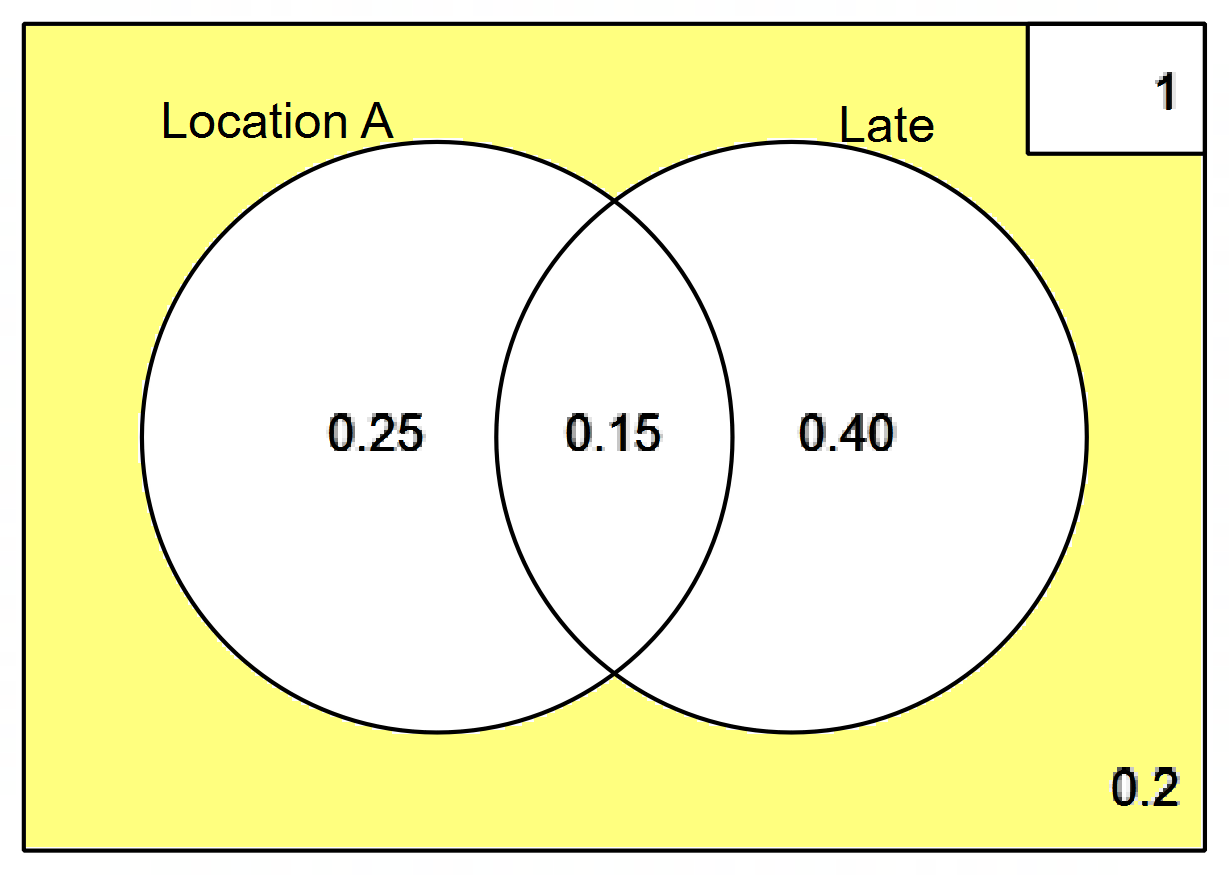
Probability of leaving late = 0.55

P(Leaving from Location A and leaving late) = 0.15 ✓

0.4 x 0.55 = 0.22 and not 0.15, ✓

therefore the events are dependent. ✓

(iii)  ✓



(c) (i)

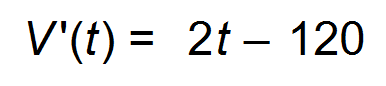
✓✓

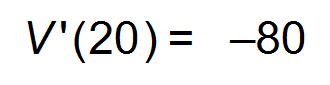
(ii) Shading ✓ [10]

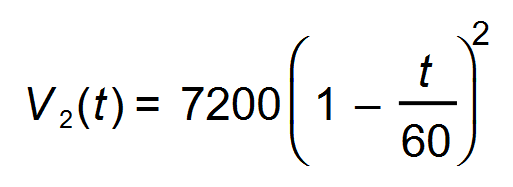
**Calculator−assumed Solutions**

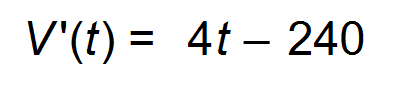
8. (a)  ✓

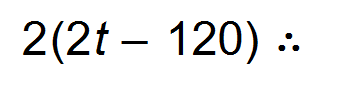
(b) 60 mins ✓

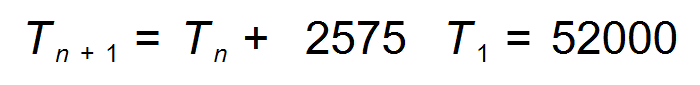
(c)  ✓

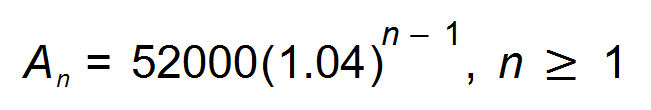
litres per minute ✓

(d) 

 ✓

This isdouble the rate ✓ [6]

9. (a)  ✓✓

(b)  ✓✓

(c) $74 012.21 ✓

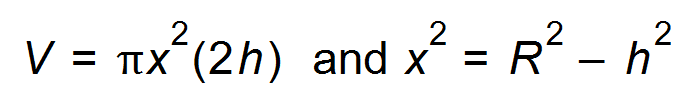
(d) During the 13th year (83253>82900) ✓✓

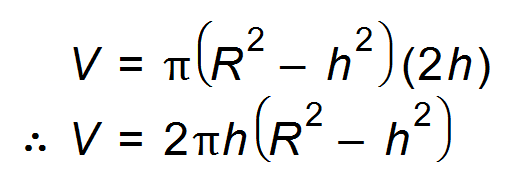
(e) Skye: $1 548 460. 09 ✓

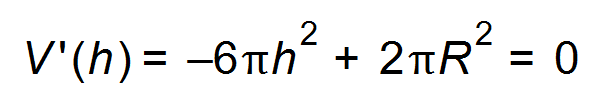
Indy: $1 529 250.00 ✓

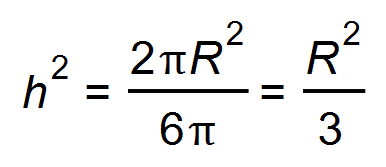
Skye’s total earnings exceeds Indy’s total earnings

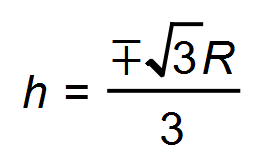
by $19 210.09 ✓ [10]

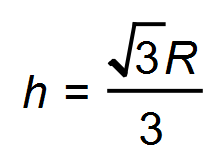
10. (a)  ✓✓

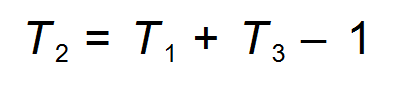
 ✓

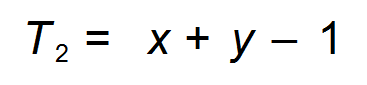
(b)  (for max/min) ✓

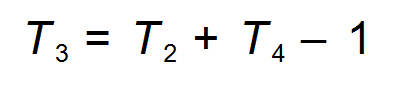
 ✓

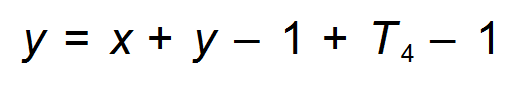
 Discard negative *h*

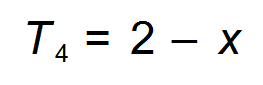
 ✓ [6]

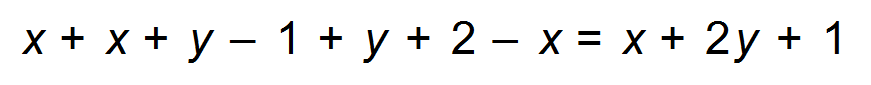
11. (a)  ✓



(b) 

 ✓

 ✓

Sum =  ✓

(c) No common difference nor common ratio ✓✓ [6]

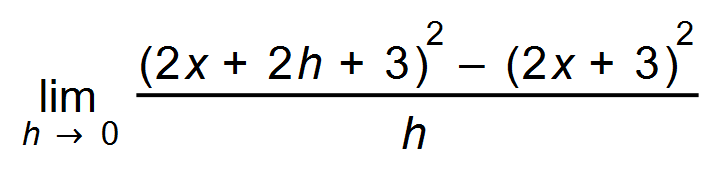
12. (a) F ✓

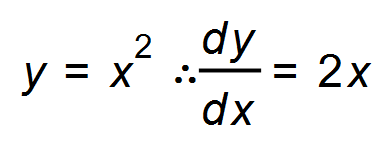
(b) F ✓

(c) F ✓

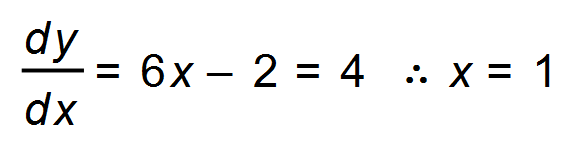
(d) T ✓

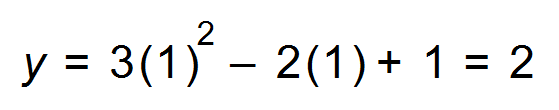
(e) F ✓ [5]

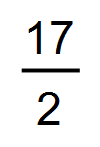
13. (a)  ✓✓

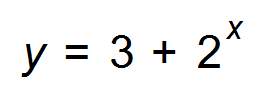
(b)  when *x* = 3 ✓

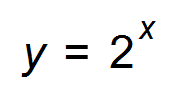
2(3) = 6 ✓

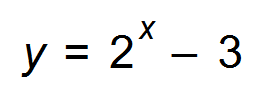
(c)  ✓

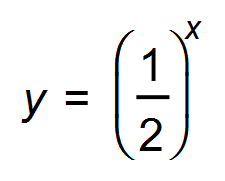
* y* = 2 ✓

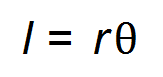
(d)  ✓ [7]

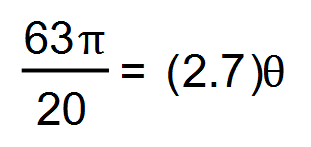
14. (a) D ✓

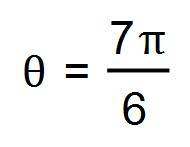
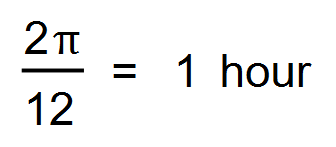
(b)  C ✓

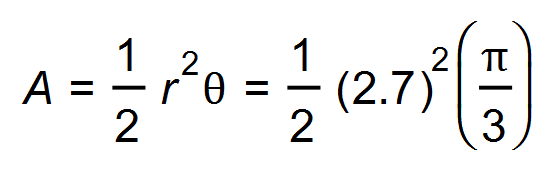
(c)  A ✓

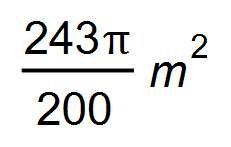
(d)  B ✓ [4]

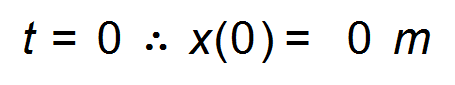
15. (a) 

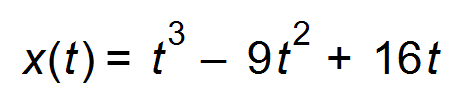
 ✓

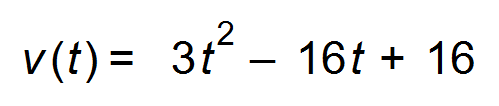
   this has taken 7 hours. ✓✓

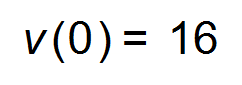
(b)  ✓

=  ✓ [5]

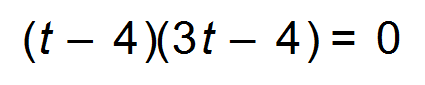
16. (a)  ✓

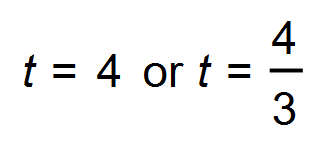
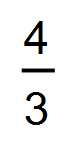
(b) 

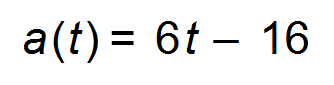
 ✓

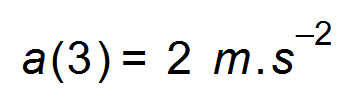
 m/s ✓

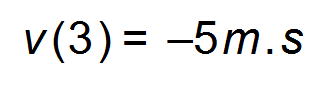
The particle is initially travelling to the right of the origin. ✓

(c) 

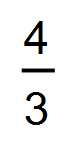
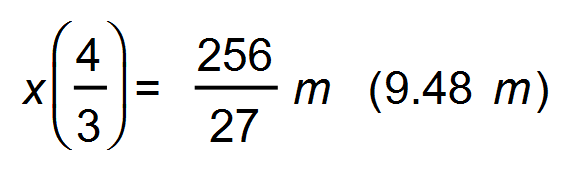
 First changes direction ats. ✓

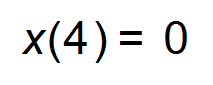
(d)  ✓

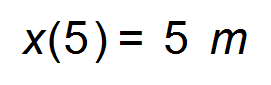
 ✓

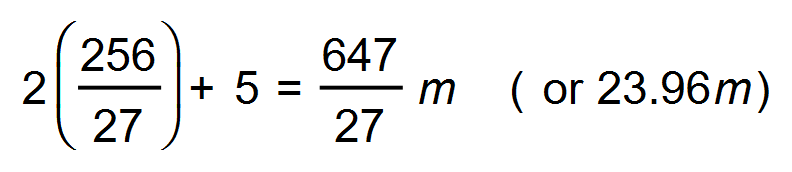
(e)  ✓

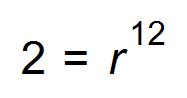
Velocity is negative and acceleration is positive therefore the particle is slowing down. ✓

(f) First turns at s.  ✓

Turns again at 4 s.  ✓

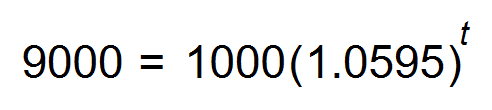


Total distance =  ✓ [12]

17. (a) 

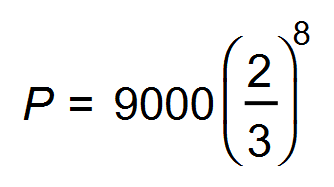
 ✓

 5.95% per hour is the rate of growth

(b)  ✓

t = 38.016

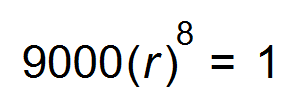
Approximately 38 hours. ✓

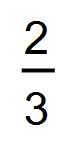
(c)  ✓

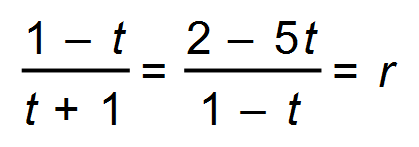
*P* = 351 bacteria left ✓

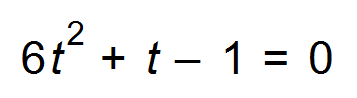
Their expectations were not accurate. The anti-biotic killed more

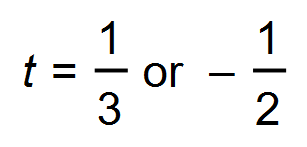
than a third of the bacteria per hour. ✓

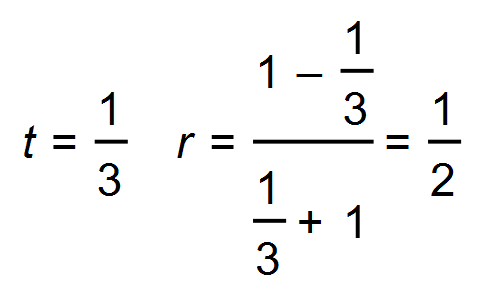
**OR**

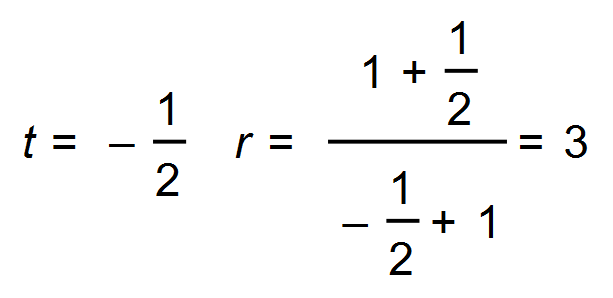
*r* = 0. 3204 The antibiotic killed 68% per hour which is more than . [6]

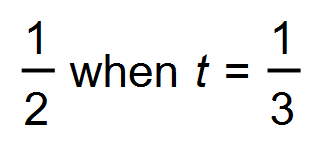
18. (a) (i)  ✓

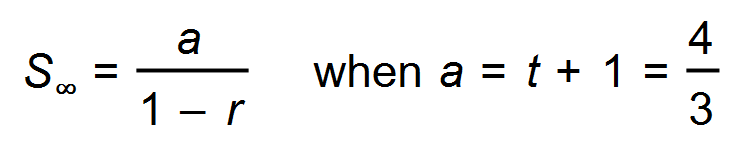


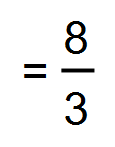
 ✓

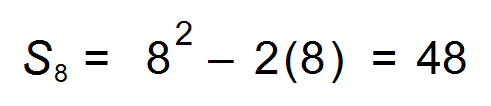
For  ✓

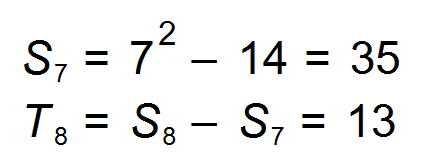
For  Discard ✓

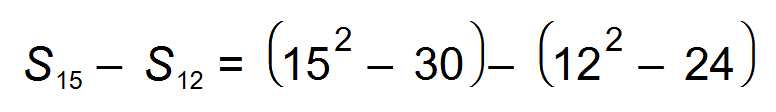
Common ratio = 

(ii)  ✓

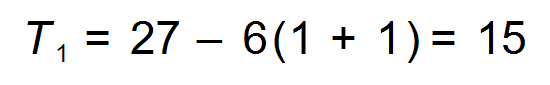
 ✓

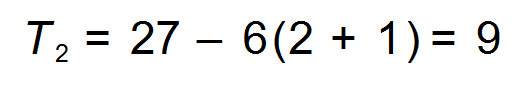
(b) (i)  ✓

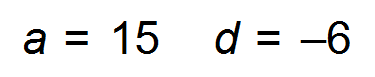
(ii)  ✓✓

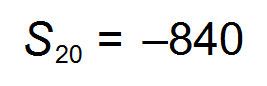
(iii)  ✓

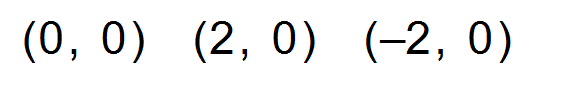
= 75 ✓

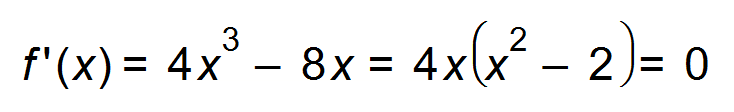
(c) 

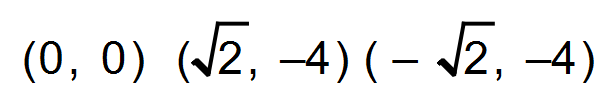


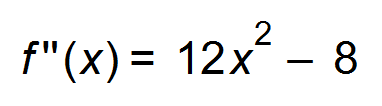
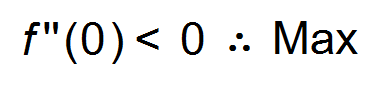
 ✓✓

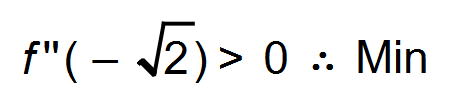
 ✓ [14]

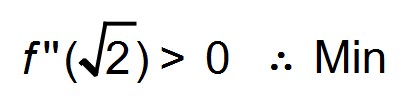
19. (a) Roots at ✓

(b) (for stationary points) ✓

Stationary points at  ✓

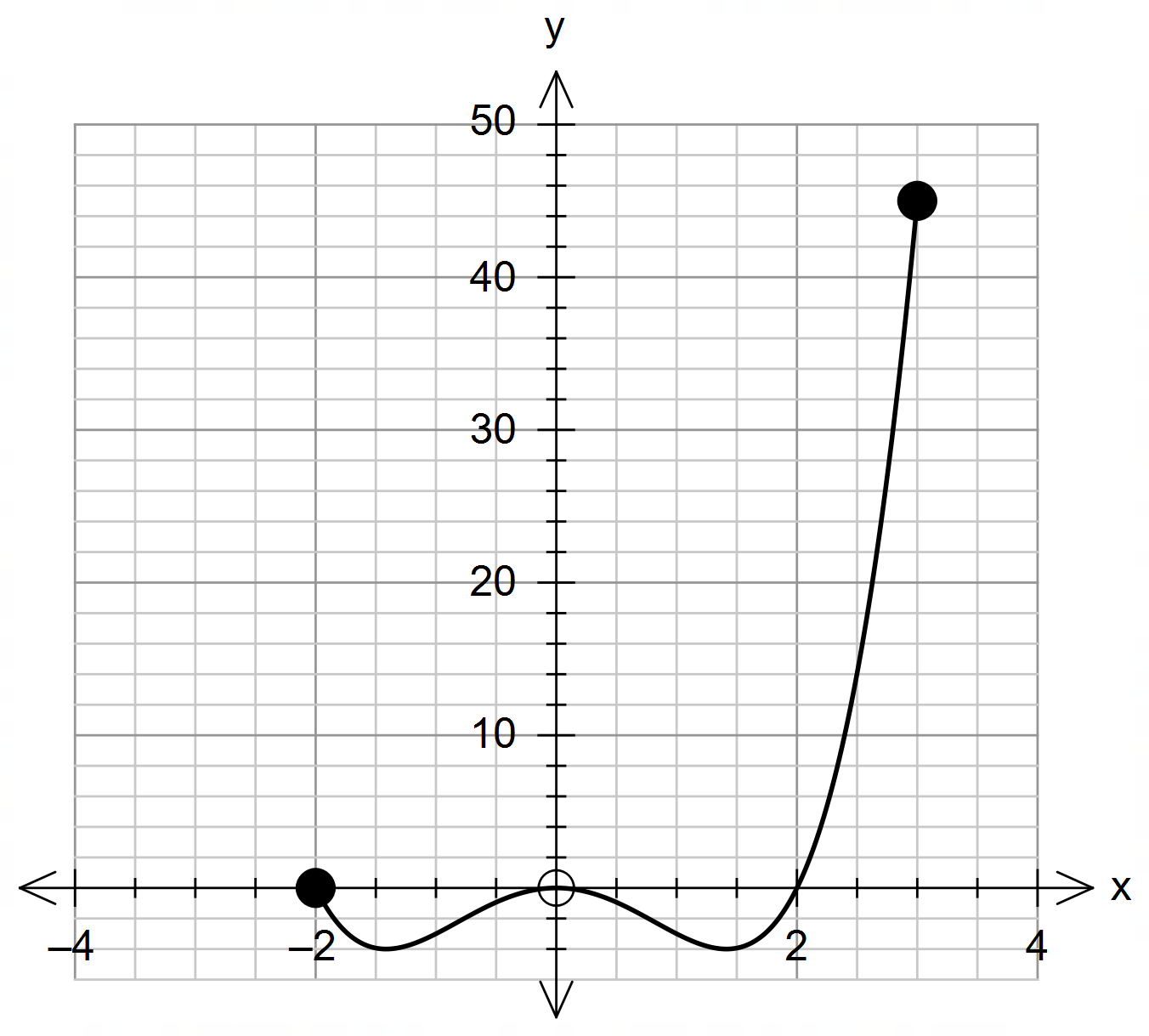
  ✓

 ✓

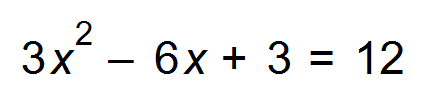
 ✓

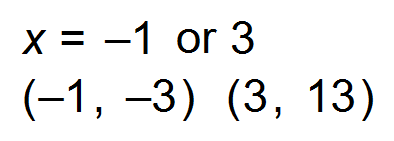
Or Sign table:

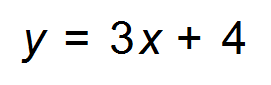
|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *x* |  |  |  | 0 |  |  |  |
| f(*x*) | ↓ |  | ↑ |  | ↓ |  | ↑ |
| f’(*x*) | - | 0  Min | + | 0  Max | - | 0  Min | + |

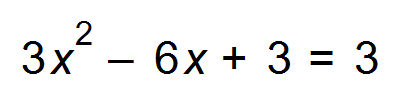
 (c)

✓✓✓ [9]

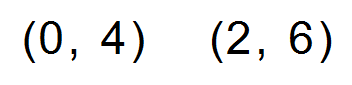
20. (a) (i) 

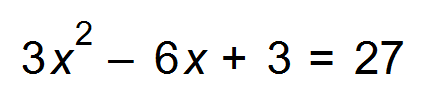
 ✓✓

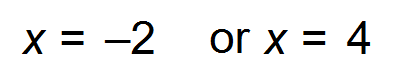
(ii)  *m* = 3

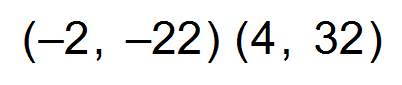


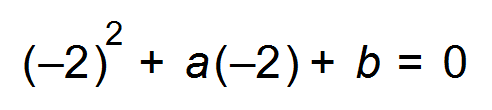
*x* = 0 or *x* = 2

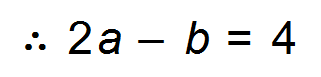
 ✓✓

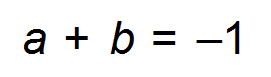
(iii) 

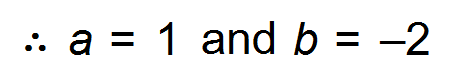


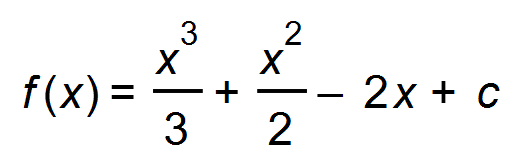
 ✓✓

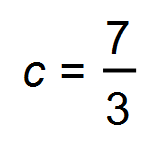
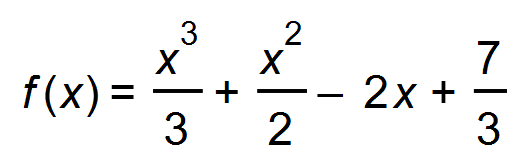
(b) 



And

 ✓✓

 | (2, 3) ✓

 The equation of the curve is . ✓ [10]

End of Questions