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**MATHEMATICS**

**METHODS**

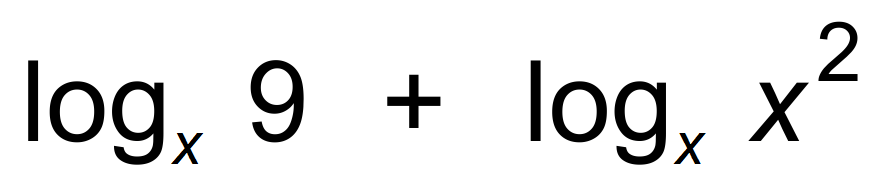
**UNITS 3 & 4**

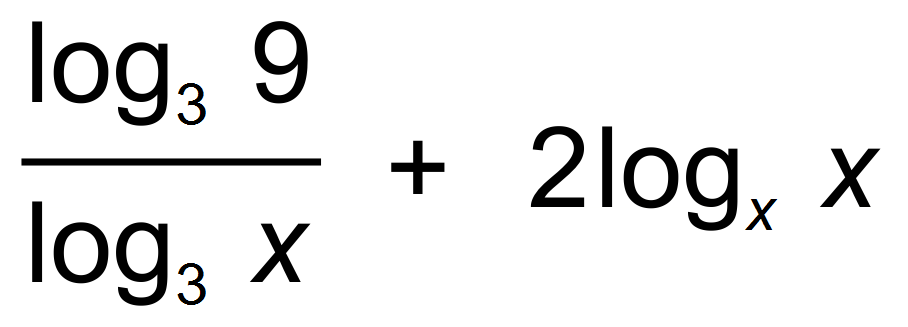
**Semester Two**

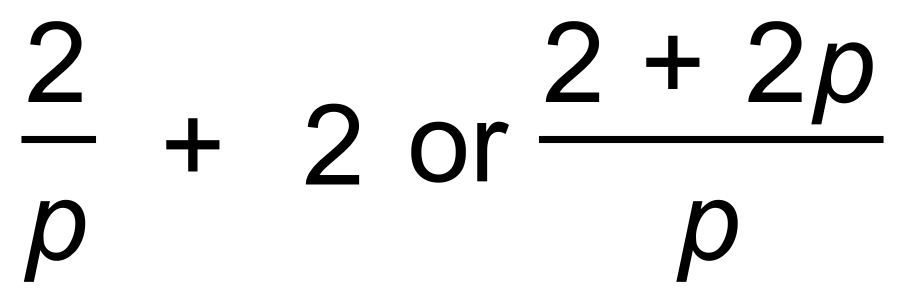
**2018**

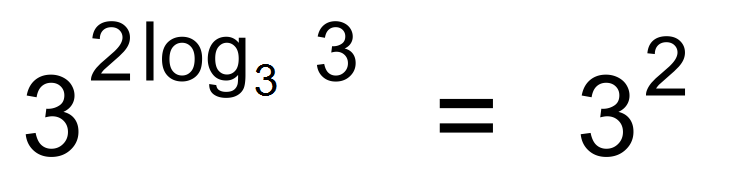
**SOLUTIONS**

***Calculator−free Solutions***

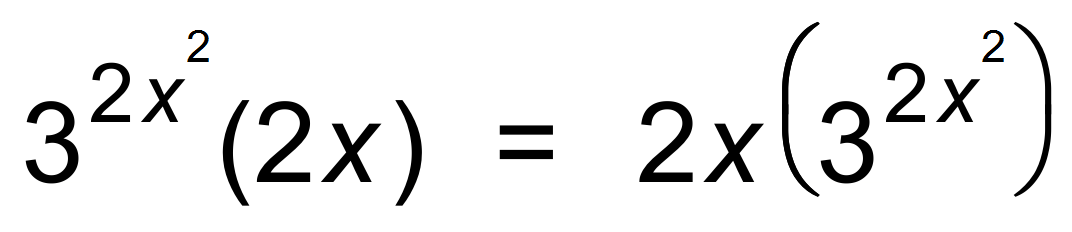
1. (a)  ✓

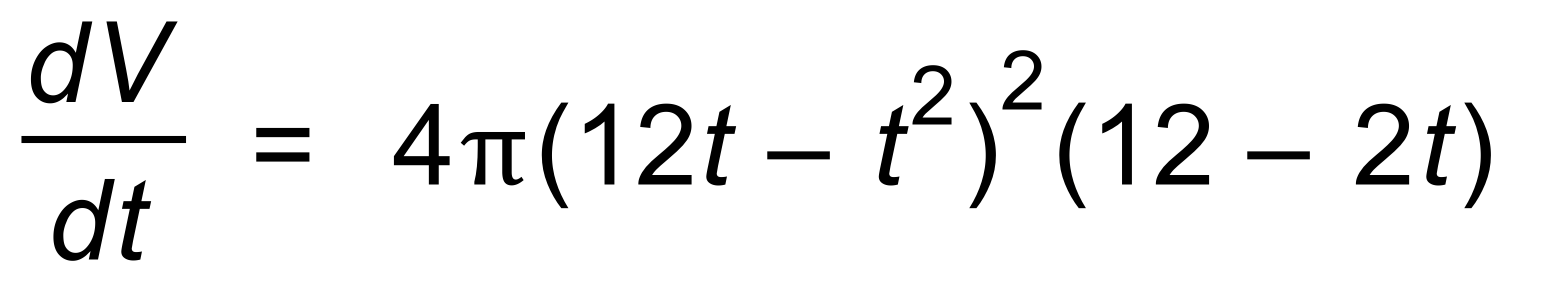
=  ✓

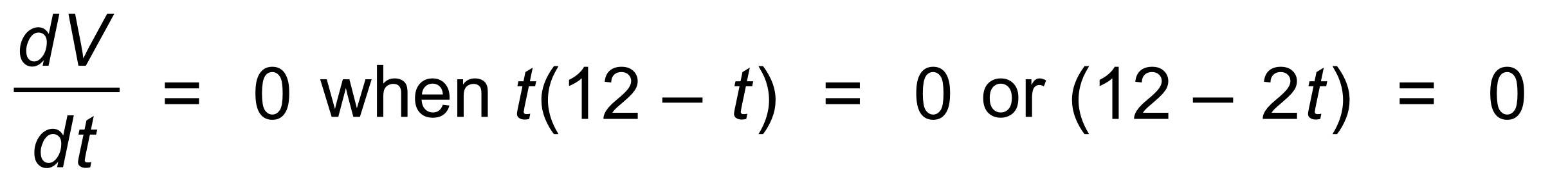
=  ✓

(b)  ✓

= 9 ✓

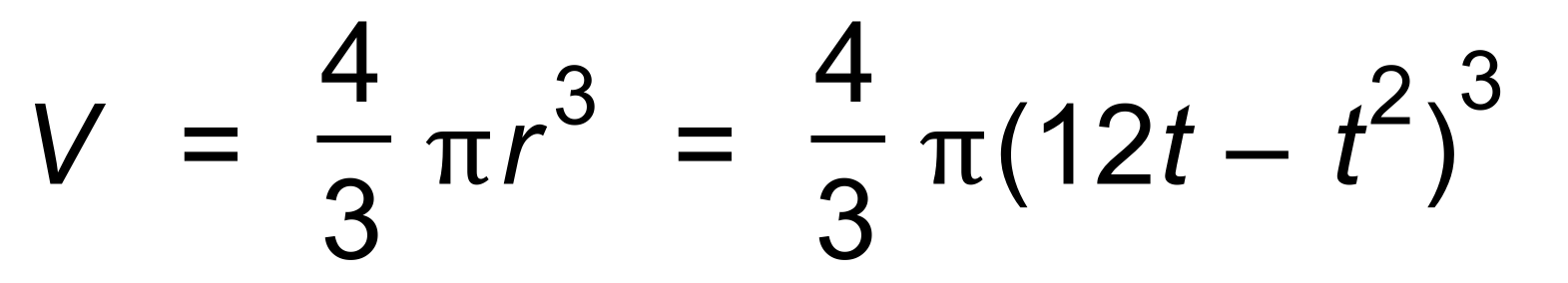
(c)  ✓✓ [7]

2. (a)  ✓

 ✓

∴  ✓

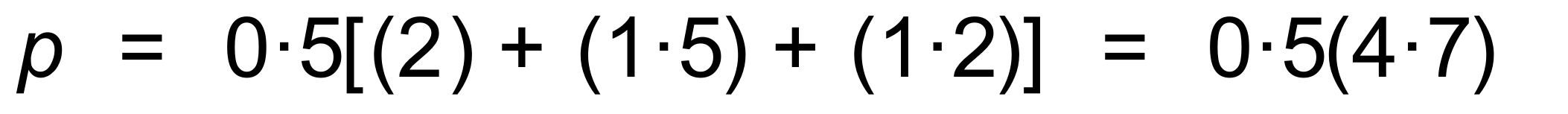
Using the sign table yields Maximum occurs at t = 6 ✓

(b) (i)  ✓

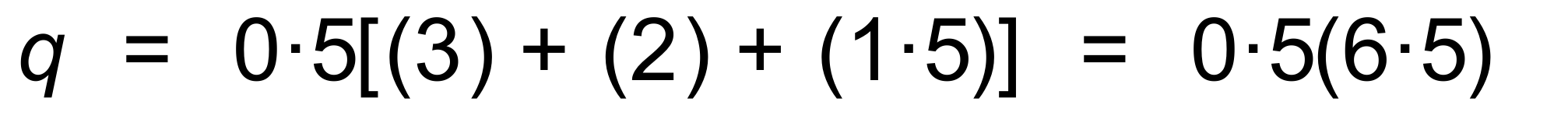
∴  ✓

(ii) When  ✓

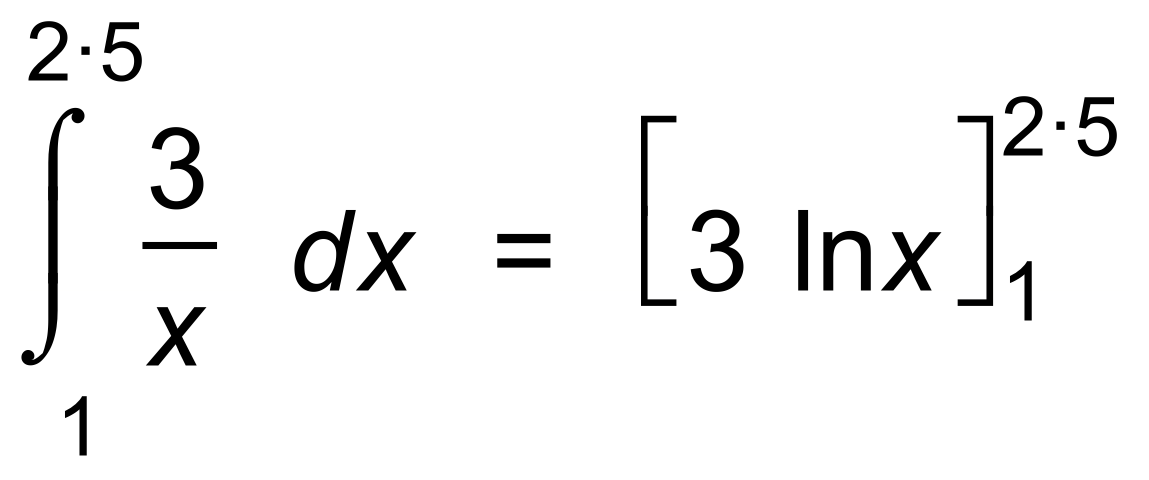
r =36 is the maximum value of r, so max Volume. ✓ [8]

3. (a)  ✓

= 2.35 ✓

 ✓

= 3.25 ✓

(b)  ✓

=  ✓ [6]

4. (a) 0.07 ✓

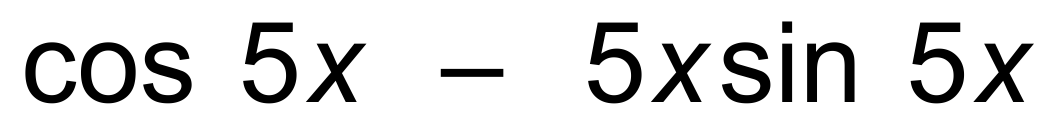
(b) 0.25 ✓

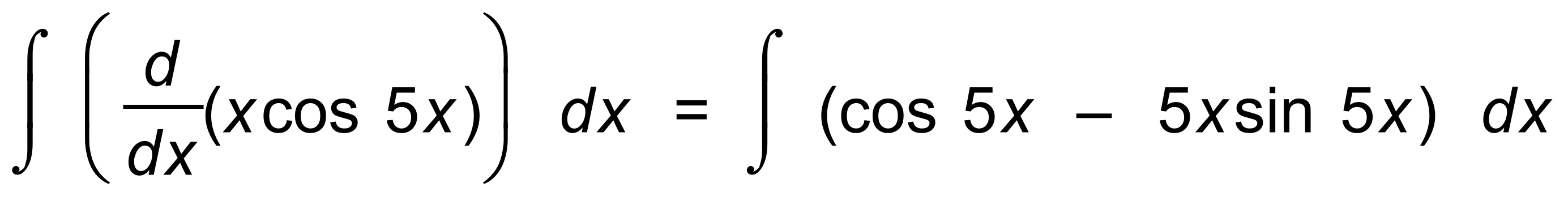
(c) P(1) = (0.1)2 = 0.01

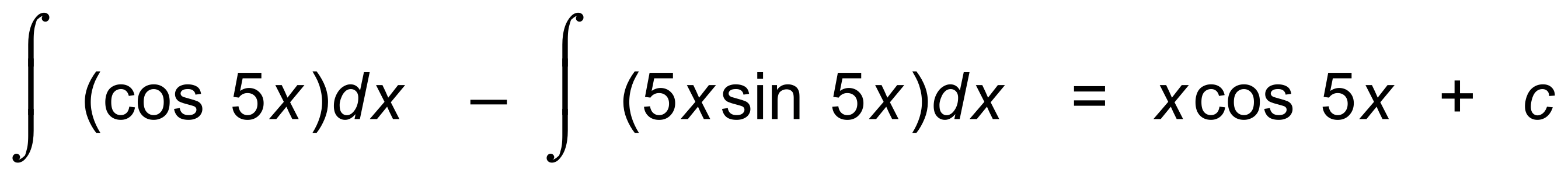
P(2) = (0.15)2 = 0.0225 ✓

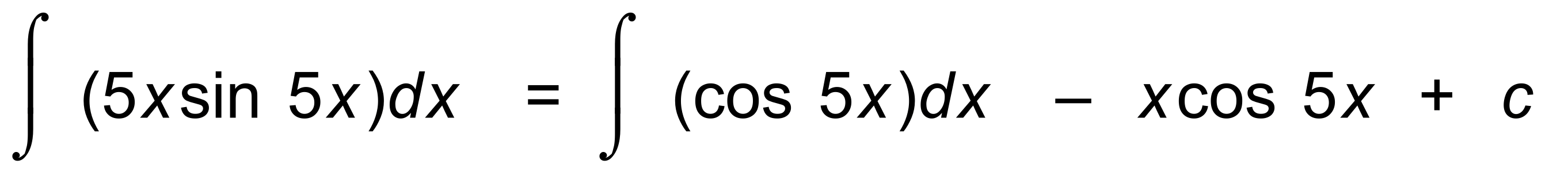
∴ P(1) + P(2) = 0.0325 ✓

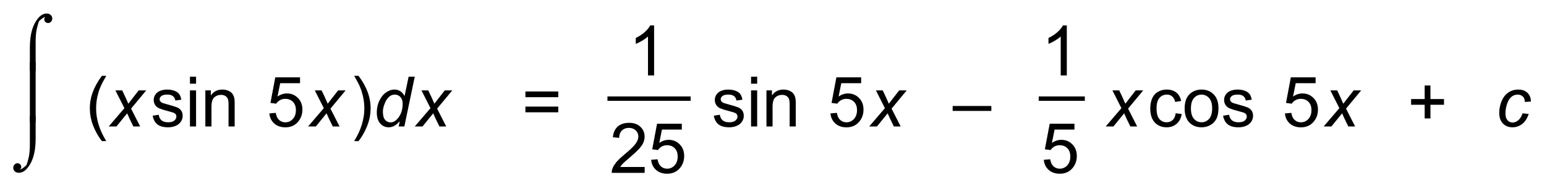
(d) Unbiased would be uniform ✓ [5]

5. (a)  ✓✓

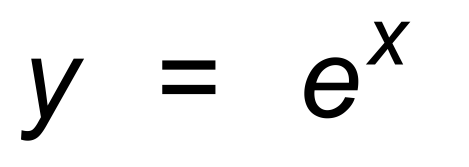
(b)  ✓

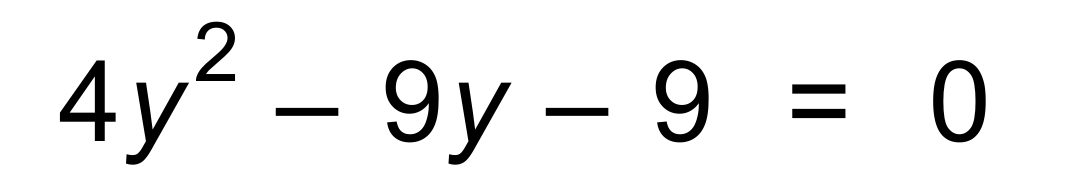
∴  ✓

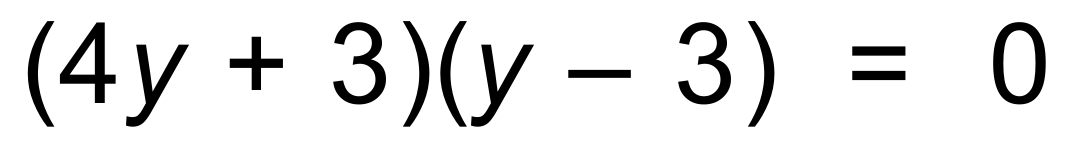
∴  ✓

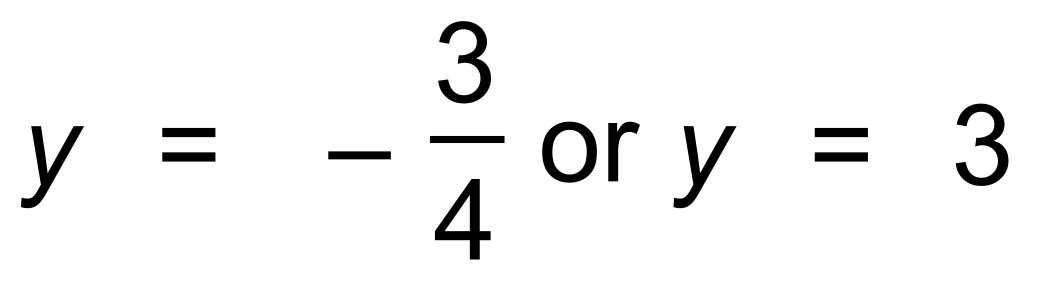
∴  ✓ [6]

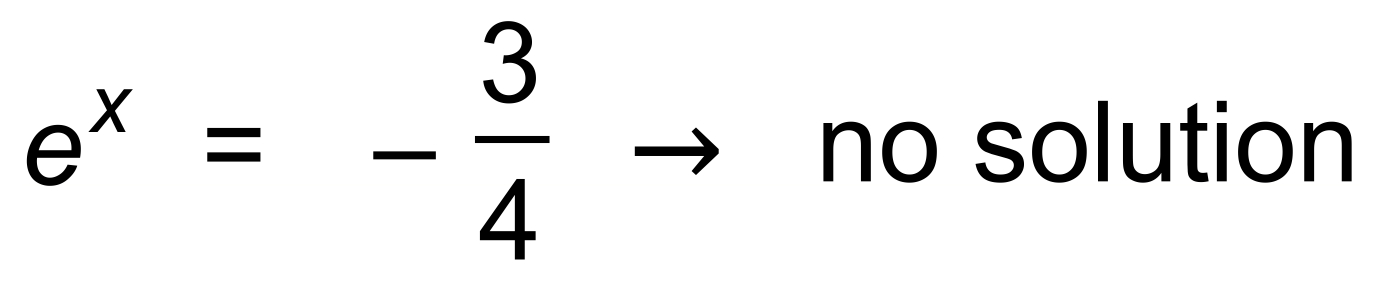
6. 

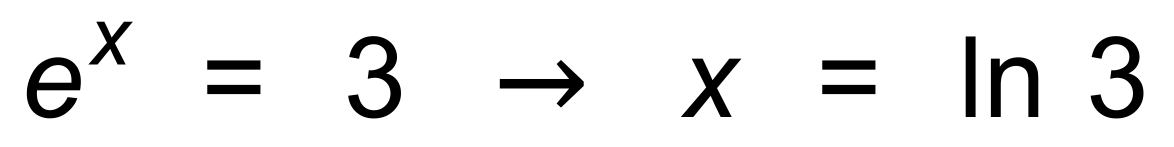
Let 

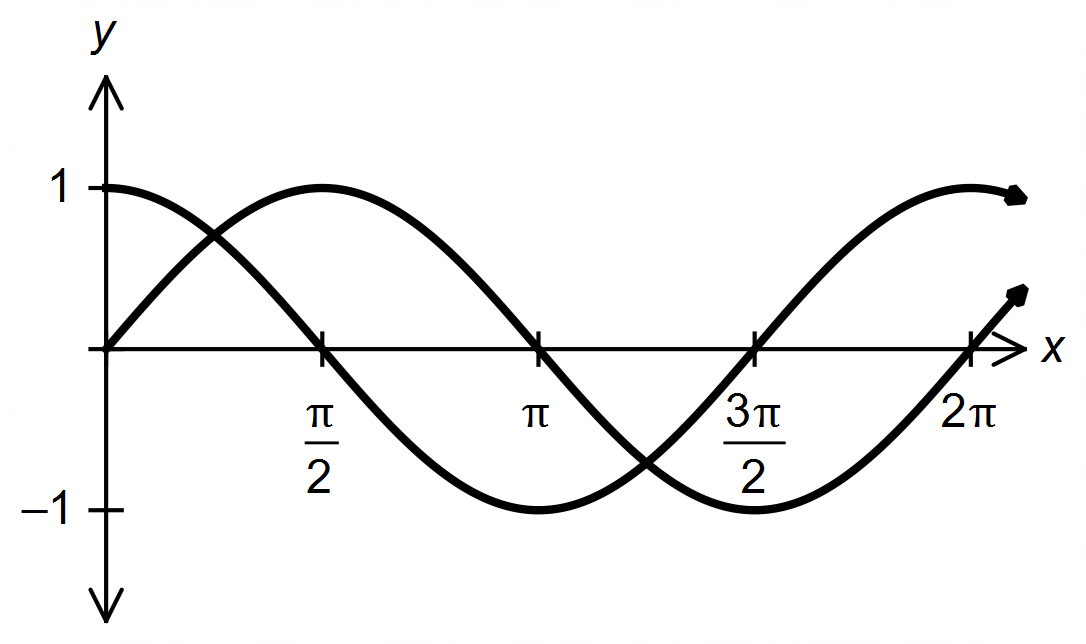
∴  ✓

∴  ✓

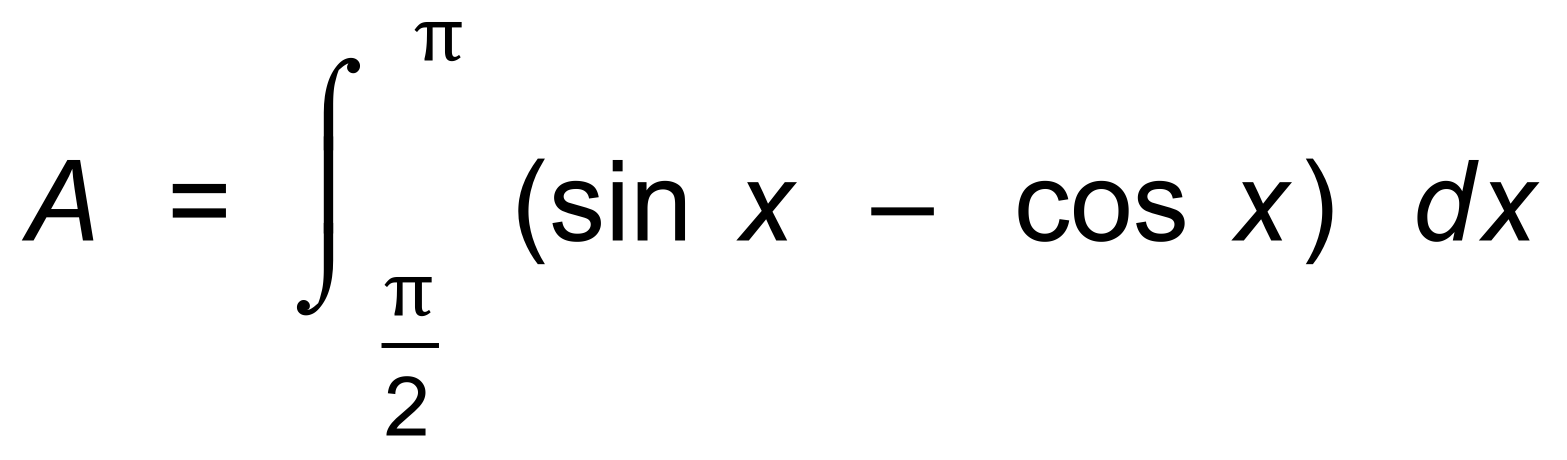
∴  ✓

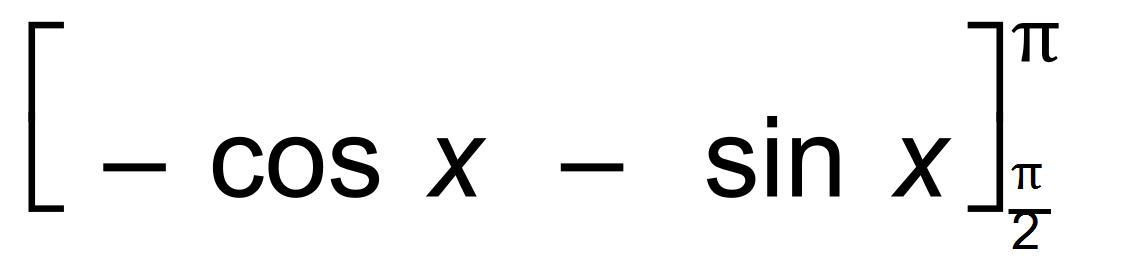
∴  ✓

and  ✓ [5]

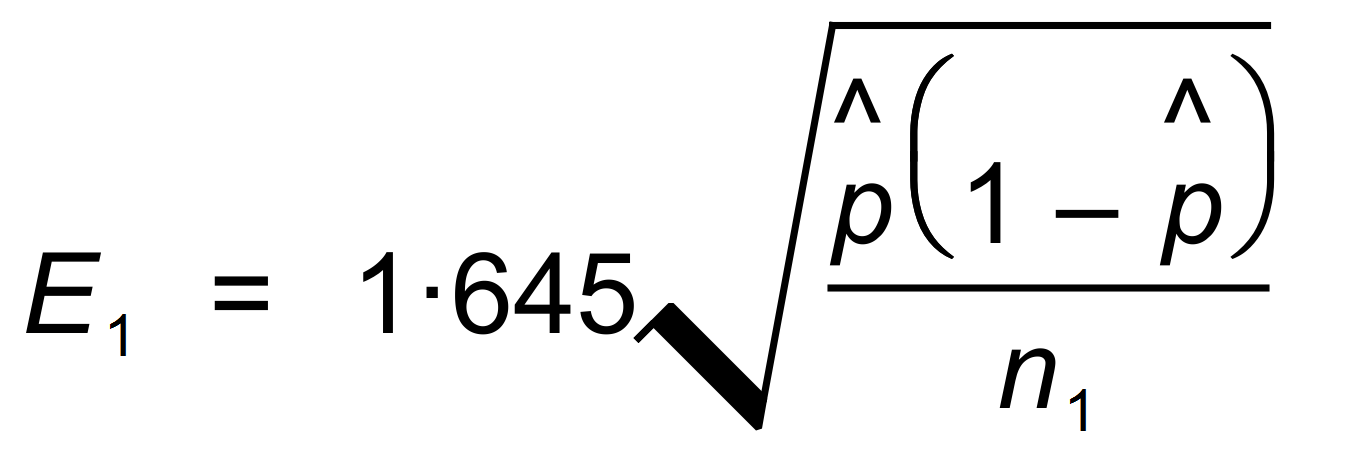
7. (a)

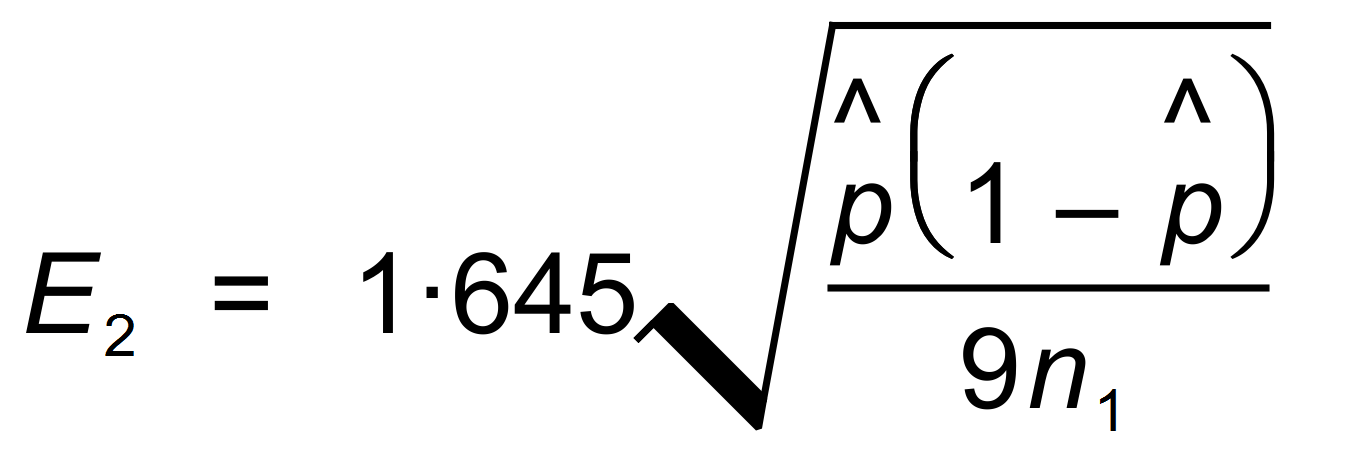
✓✓

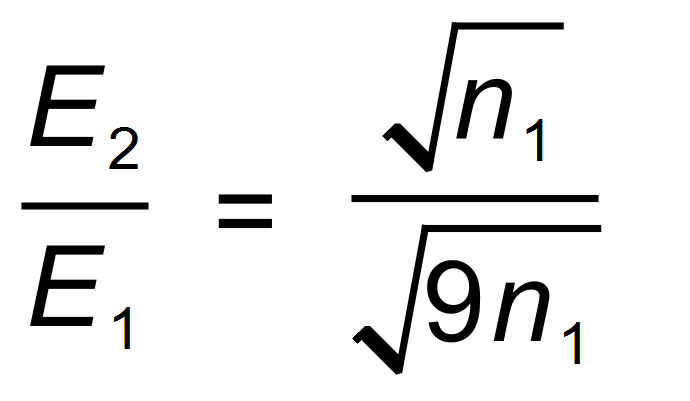
(b)  ✓

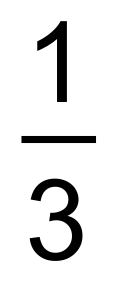
=  ✓

= (0 + 1) −(−1 − 0) = 2 ✓ [5]

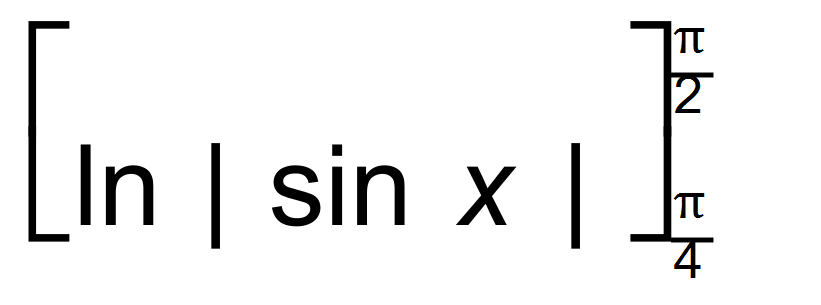
8. 

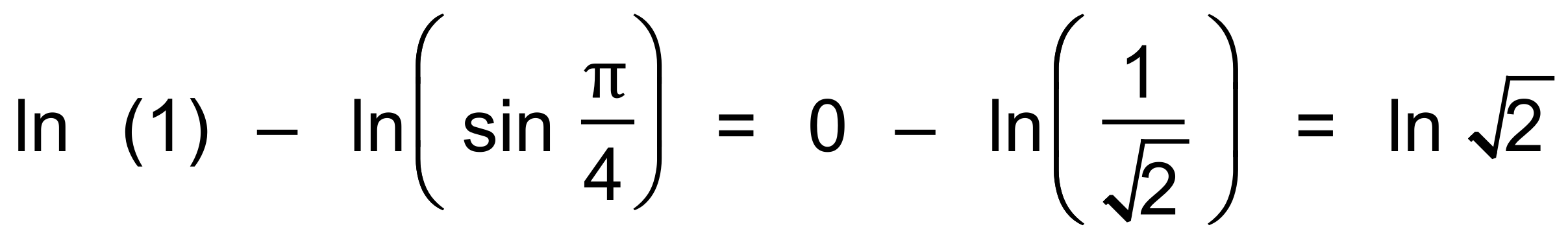
 ✓

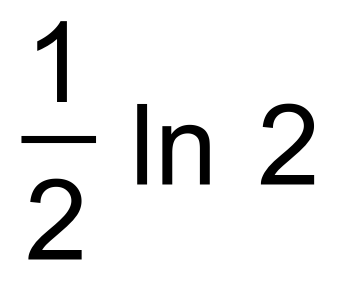
∴  ✓

=  ✓ [3]

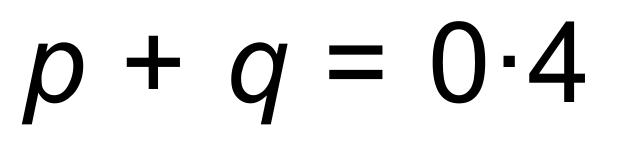
9. (a) ln |sin x| + c ✓✓

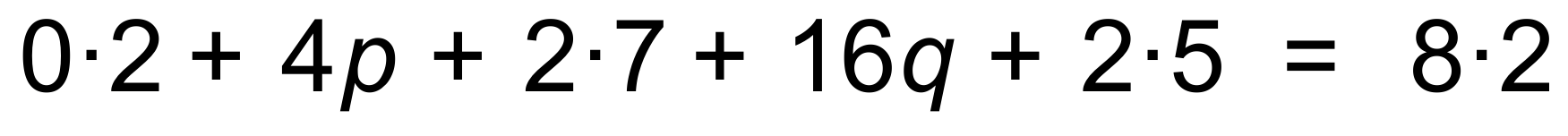
(b)  ✓

=  ✓

=  ✓ [5]

***Calculator−assumed Solutions***

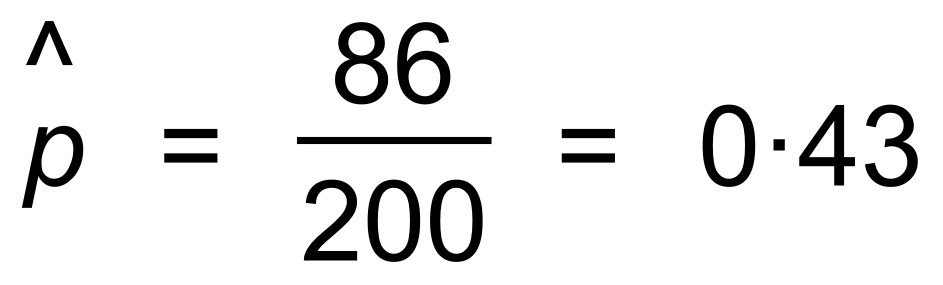
10. (a)  ✓

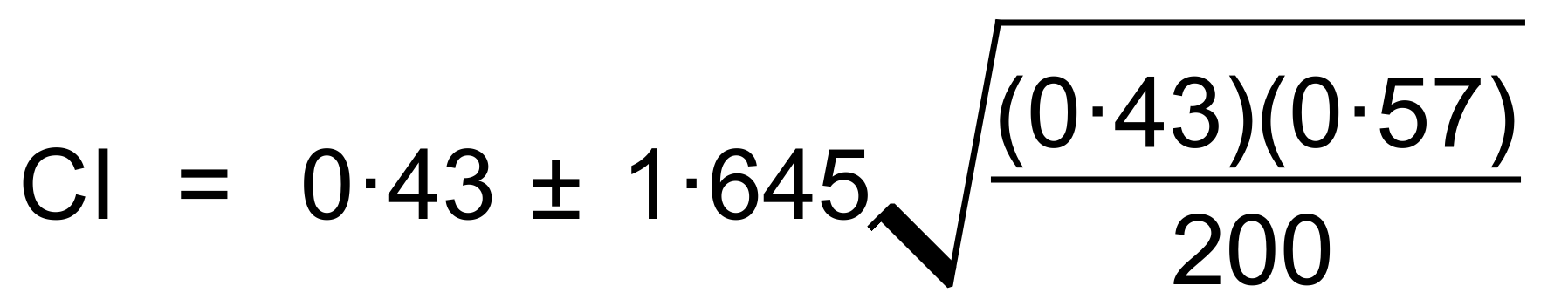
 ✓

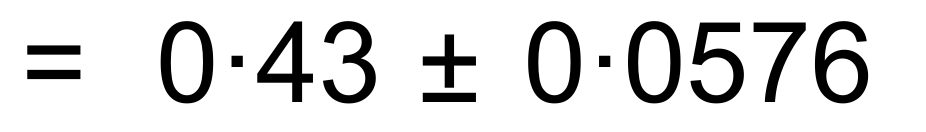
∴ From CAS p = 0.3 and q = 0.1 ✓

(b) E(X) = 0.2 + 0.6 + 0.9 + 0.4 + 0.5 = 2.6 ✓

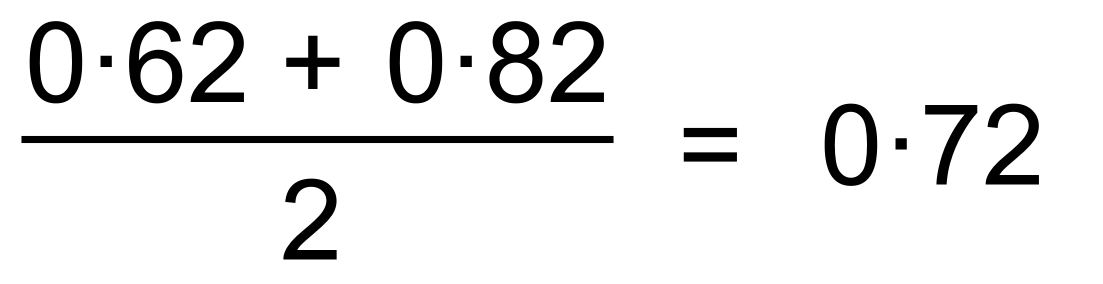
(c) E(Y) = 1 − 5.2 = −4.2 ✓ [5]

11. (a)  ✓

(b)  ✓✓

 ✓

∴  ✓

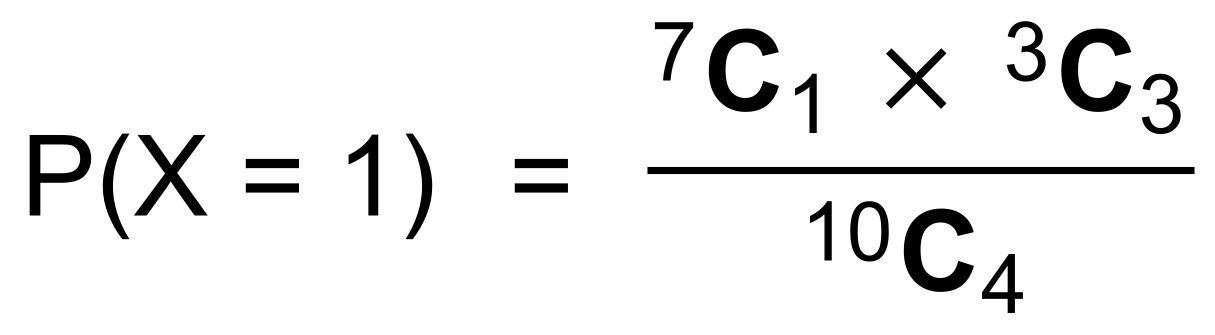
(c) The mean suggested by the CI is  ✓

This does not lie within the 90% CI as calculated in (b) ✓

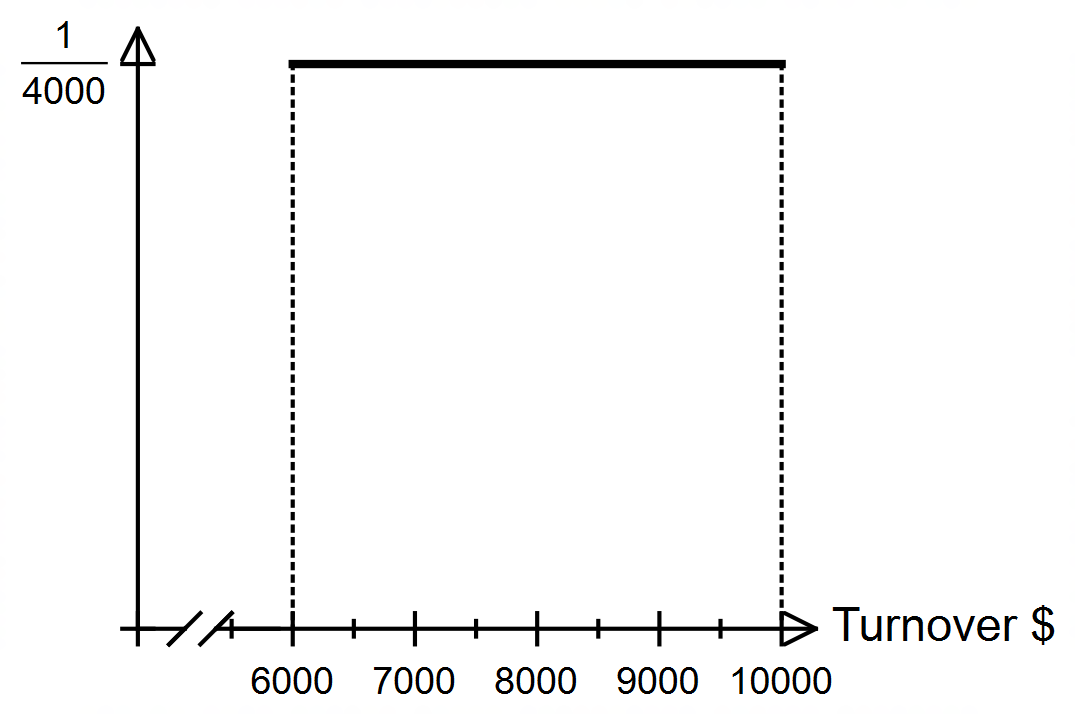
∴ Evidence doesn’t support the claim. ✓

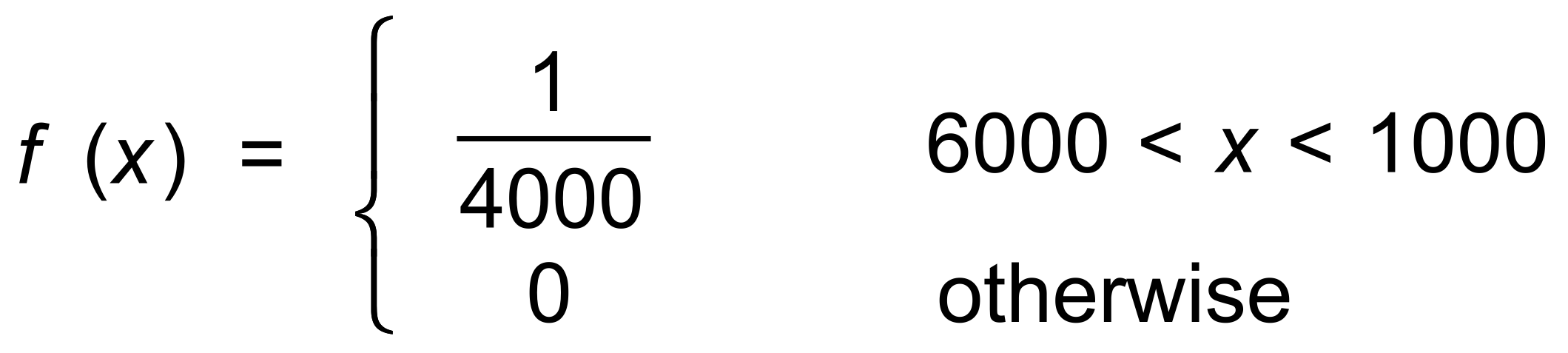
(d) (i) Binomial requires independent events and a constant

probability of success. Neither criteria apply here. ✓

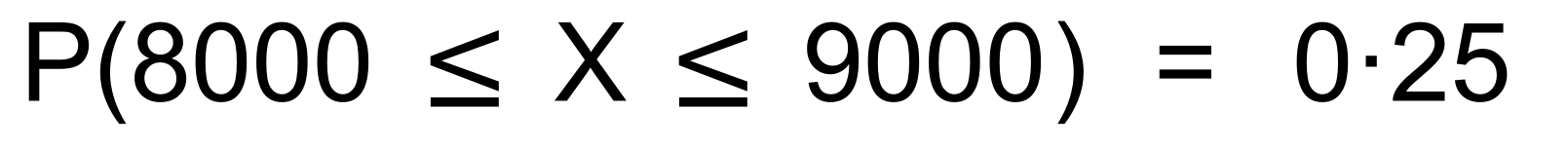
(ii)  ✓✓

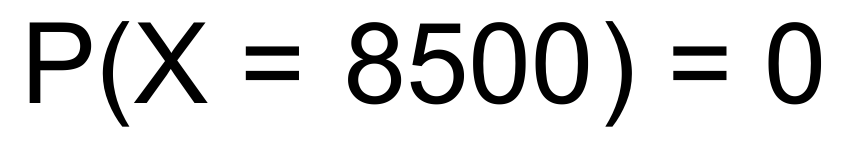
= 0.1 ✓ [12]

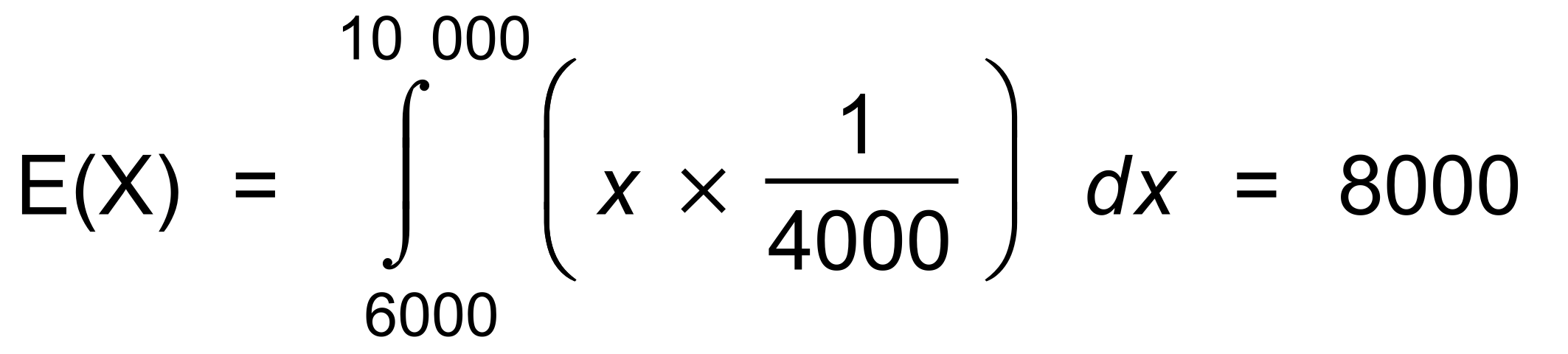
12. (a)

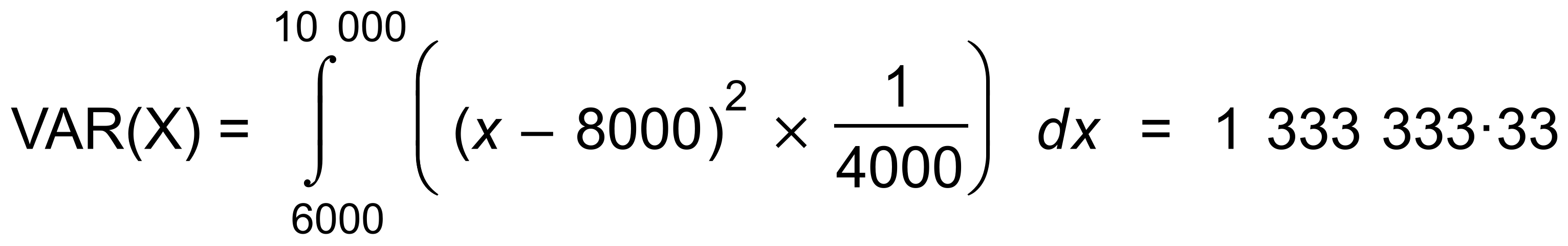


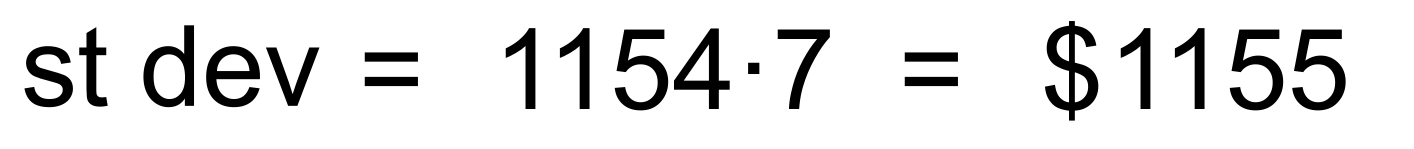
✓✓

(b) (i)  ✓

(ii)  ✓

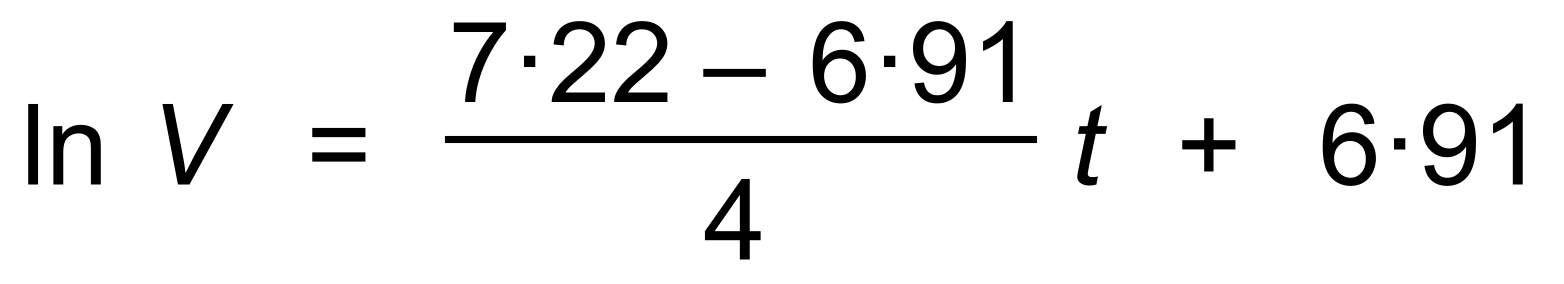
(c)  ✓✓

(d) (i)  ✓✓

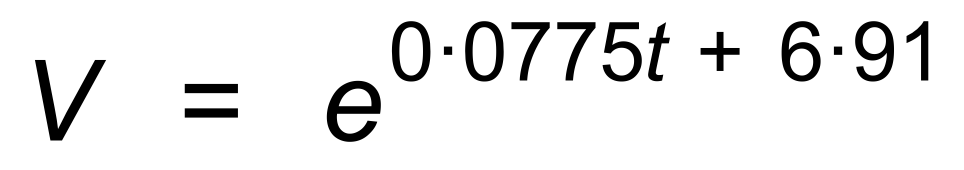
∴  ✓

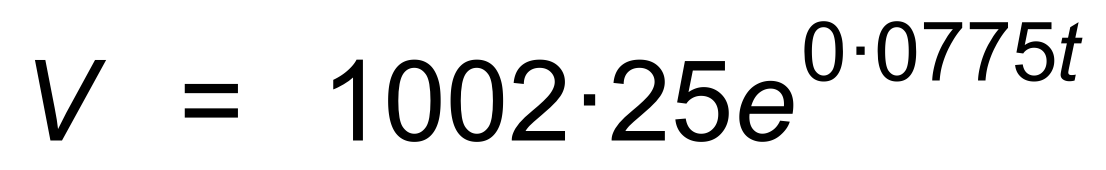
(ii) Standard deviation = $1155

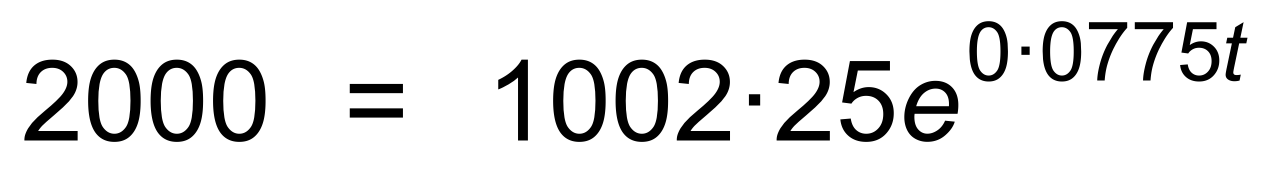
Not affected by change of origin ✓ [10]

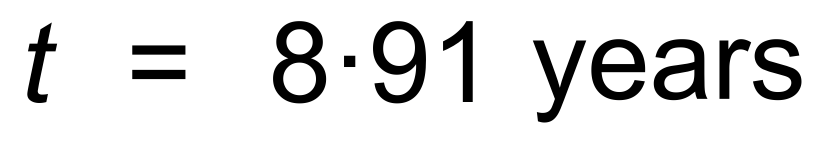
13. (a) (i)  ✓

∴  ✓

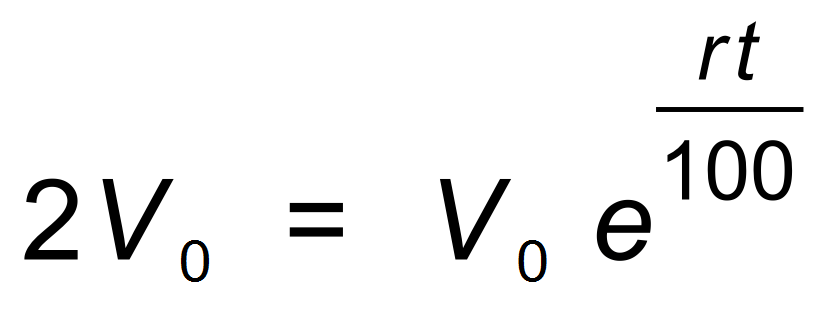
(ii)  ✓

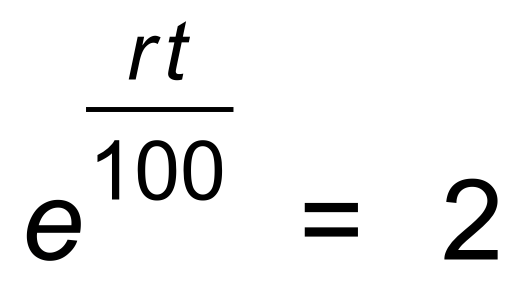
∴  ✓

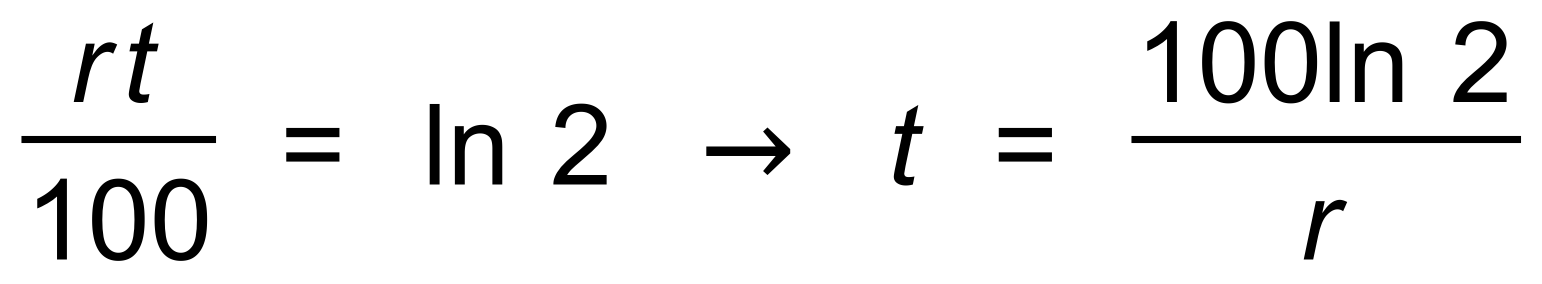
(b)  ✓

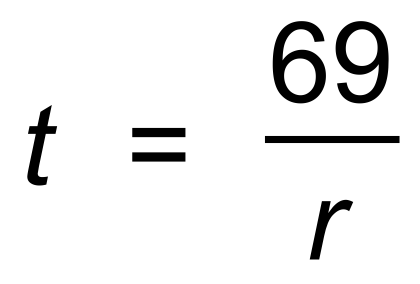
∴  ✓

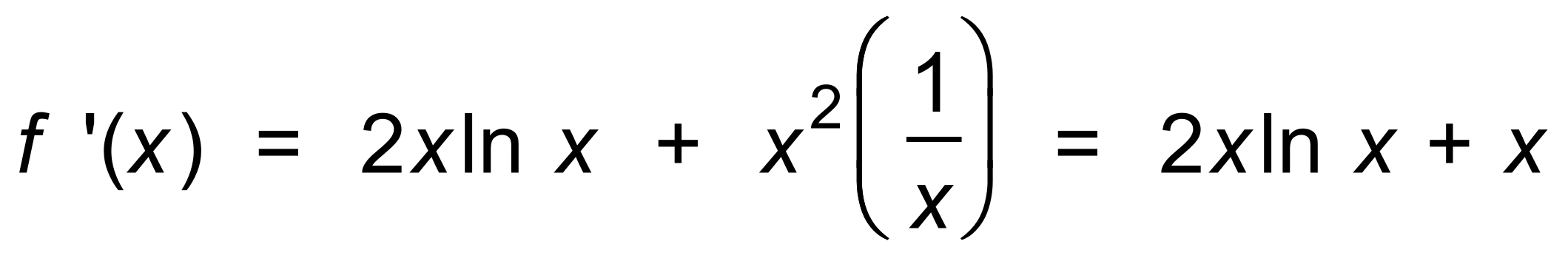
(c) 

∴ 

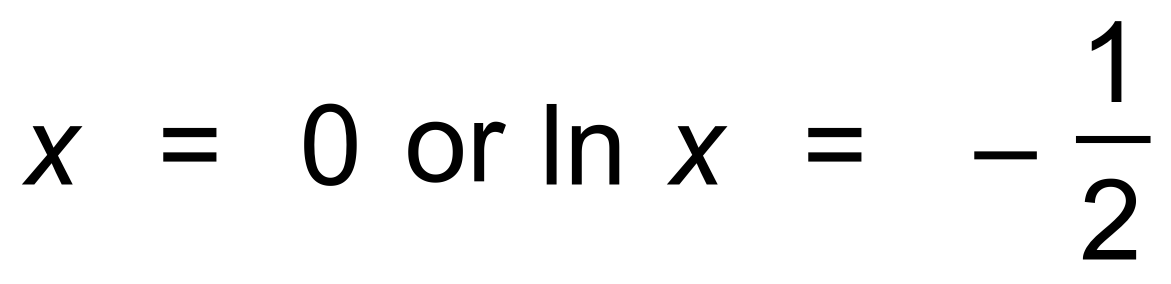
∴  ✓

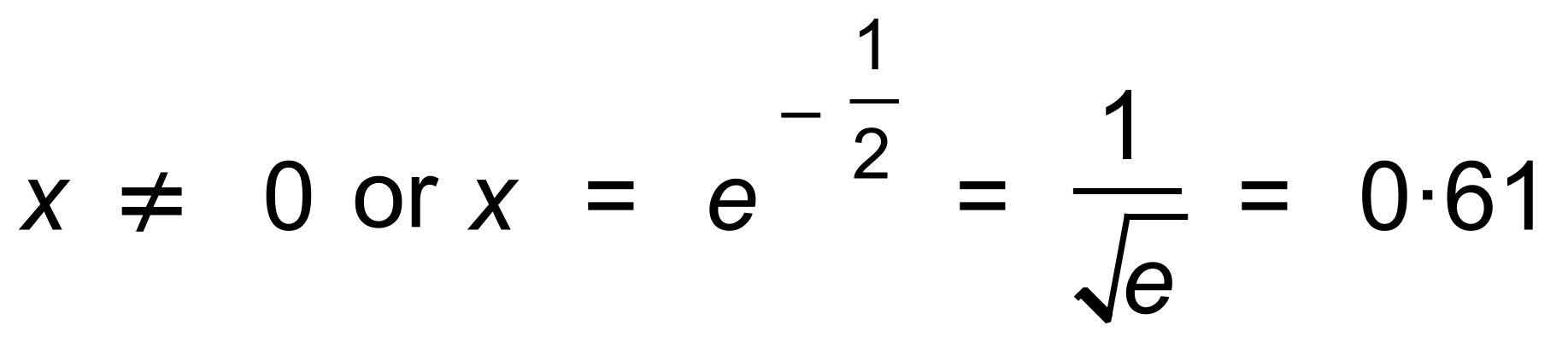
∴  ✓

∴  ✓ [9]

14. (a)  ✓

∴ 

∴  ✓

ie  ✓

 ✓

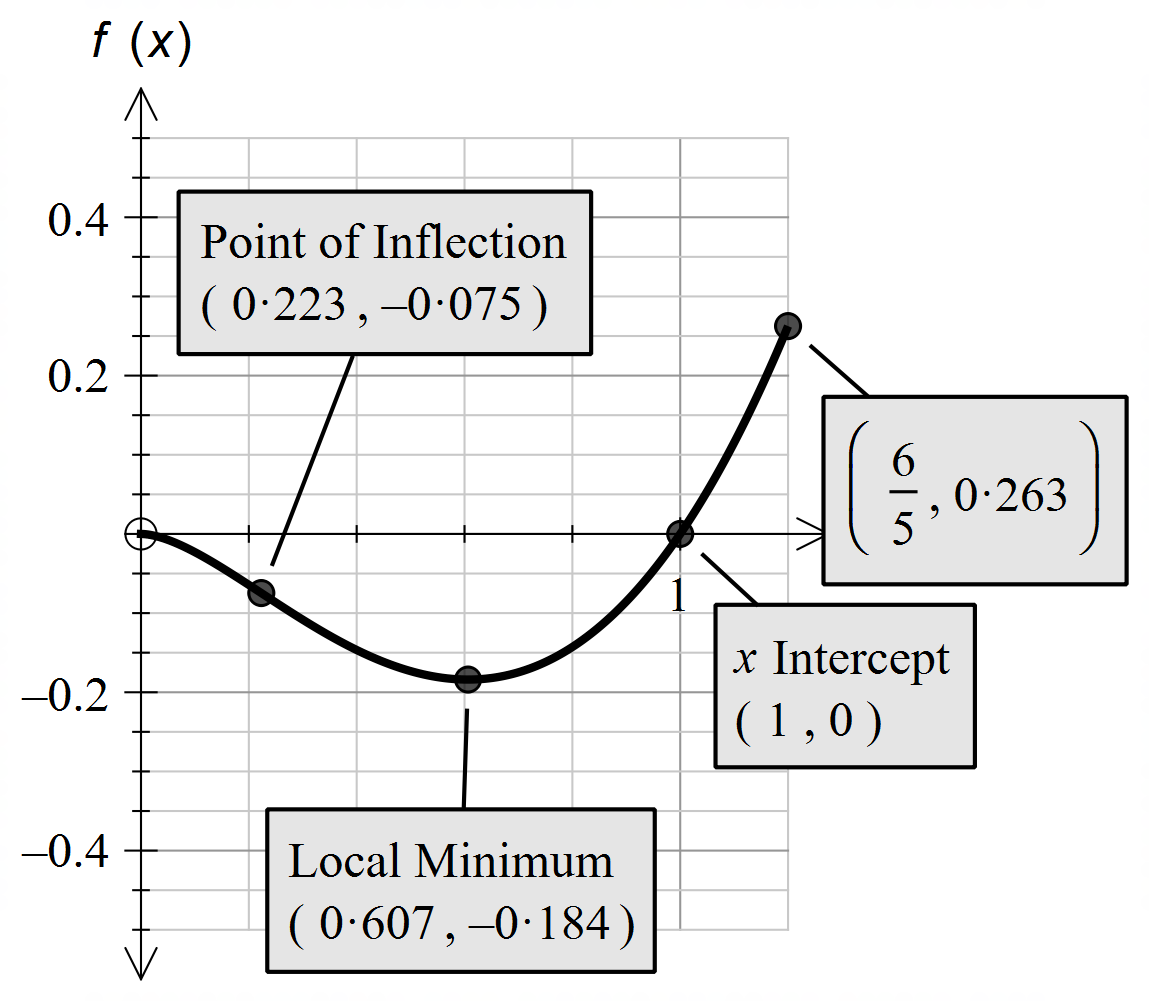
∴  ✓

(b) 

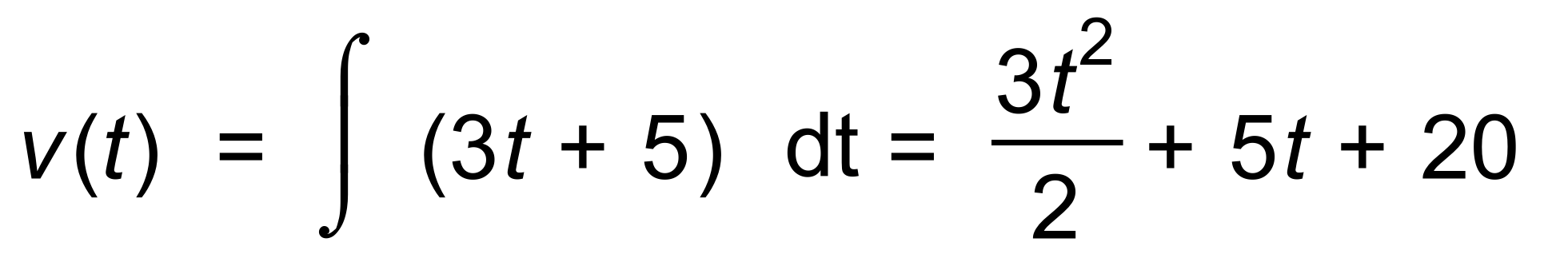
 ✓

∴ Oblique POI at  ✓✓

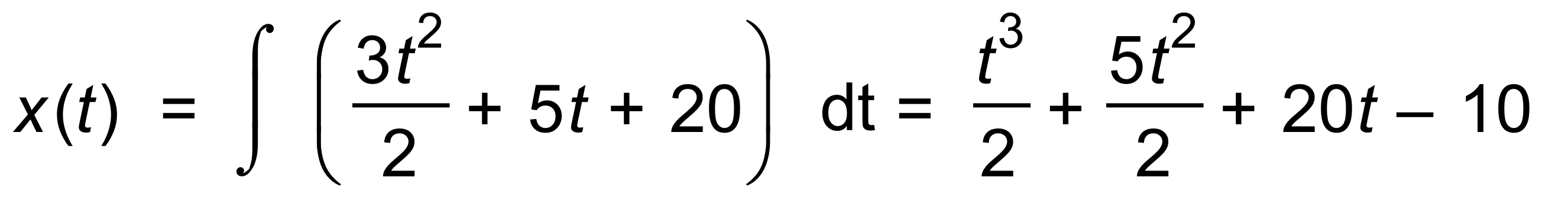
(c)

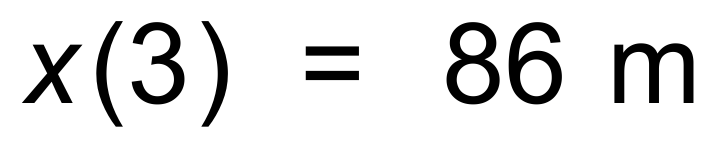


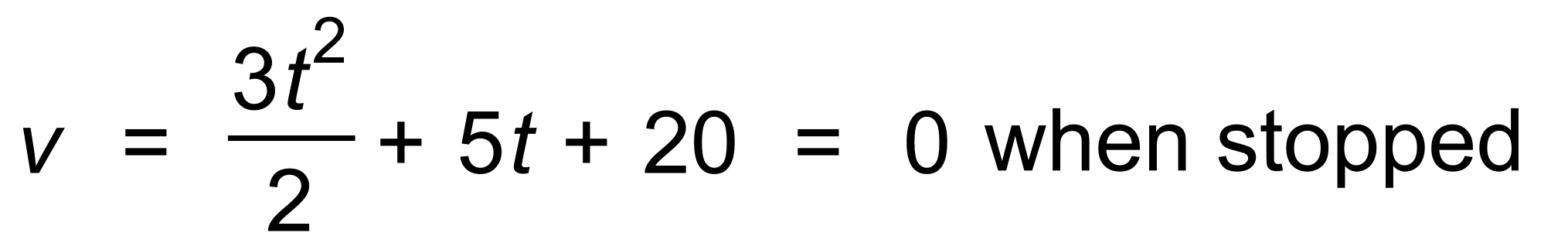
✓✓✓✓ [12]

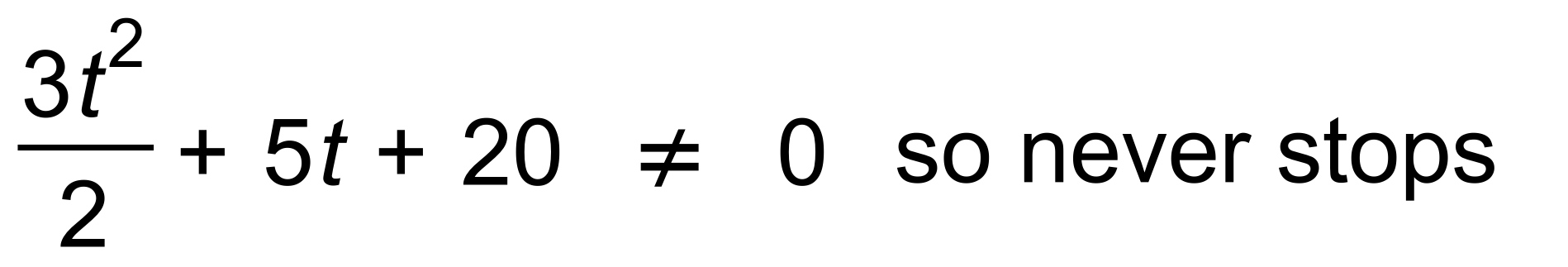
15. (a) (i)  ✓✓

∴  ✓

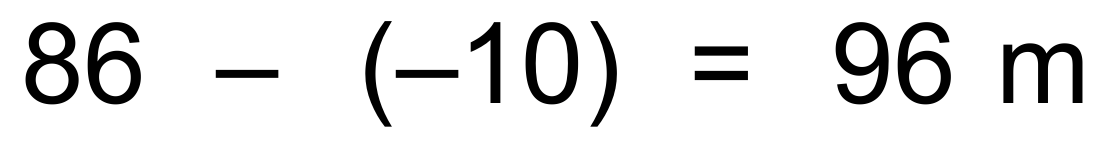
(ii)  ✓✓

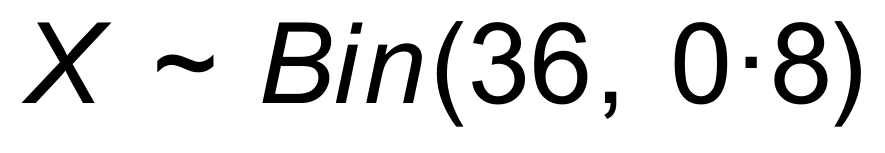
∴  ✓

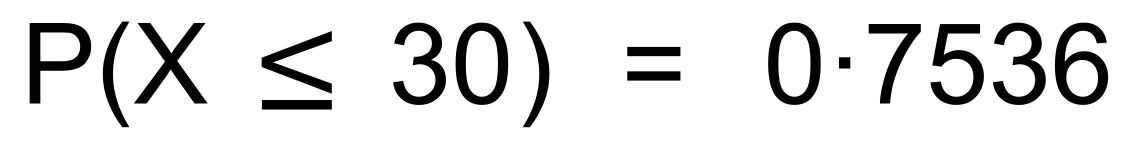
(b)  ✓

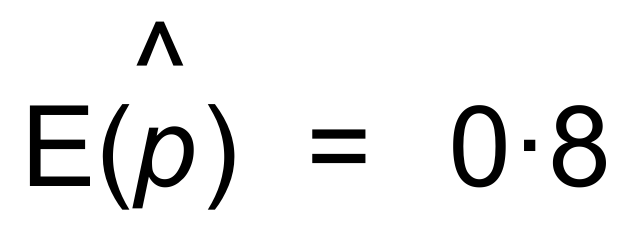
However  ✓

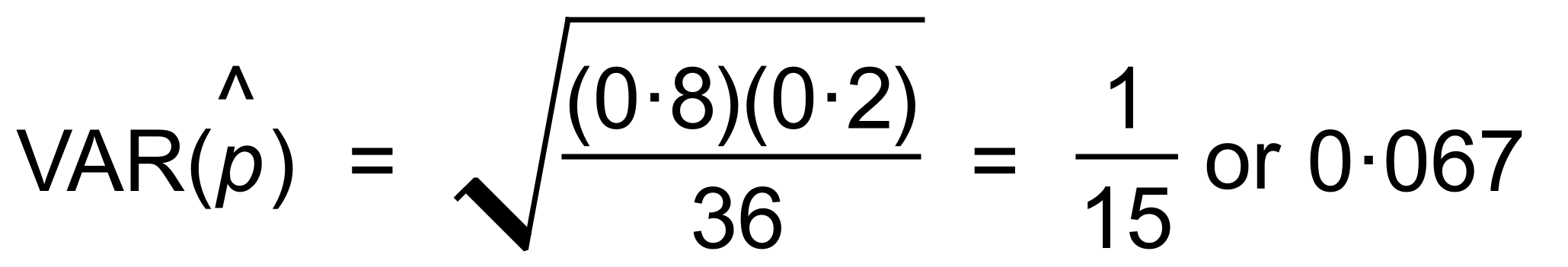
(c) Distance travelled =  ✓

∴  ✓ [10]

16. 

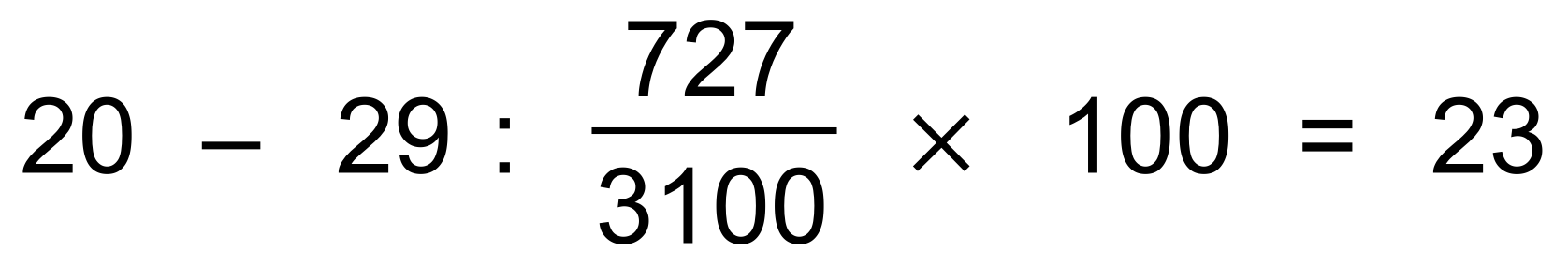
(a)  ✓✓

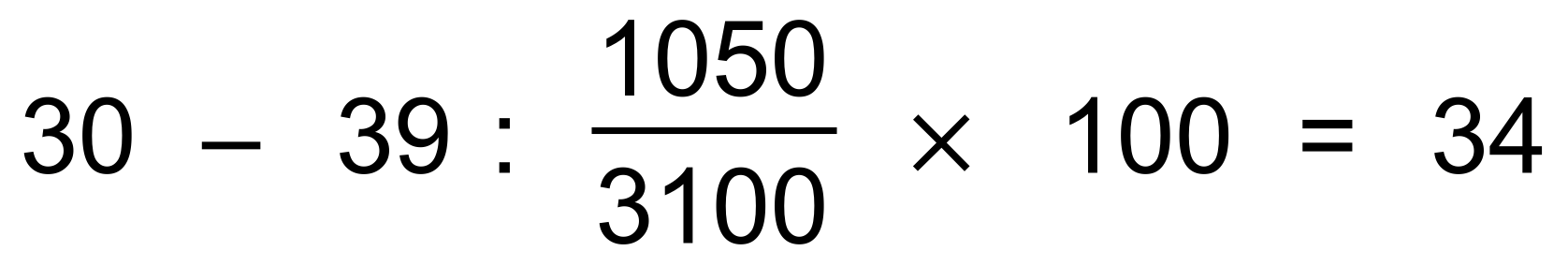
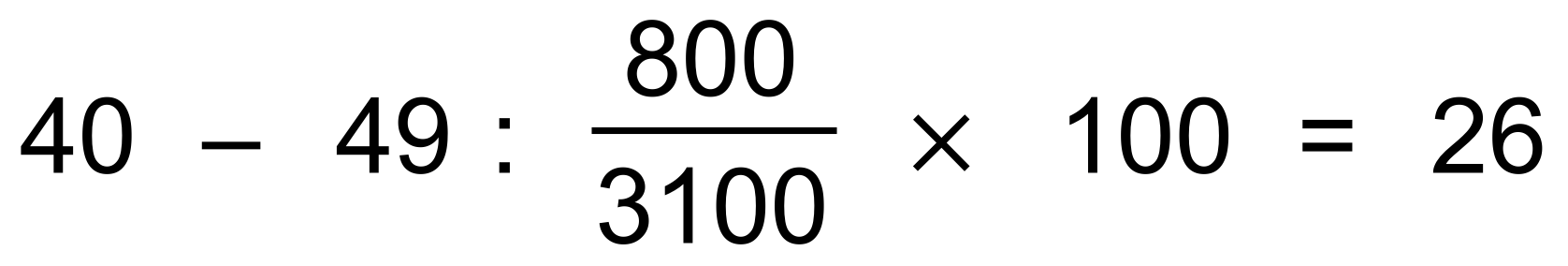
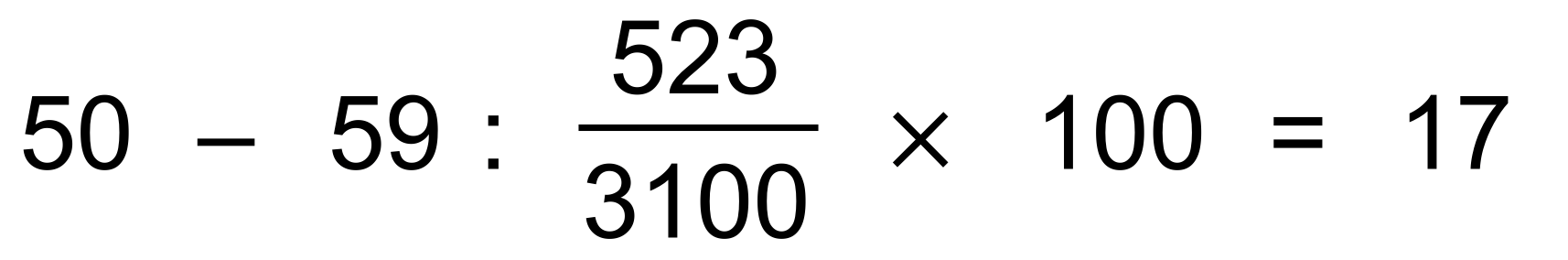
(b) (i)  ✓

(ii)  ✓✓

(c) (0.9)10 = 0.349 ✓✓ [7]

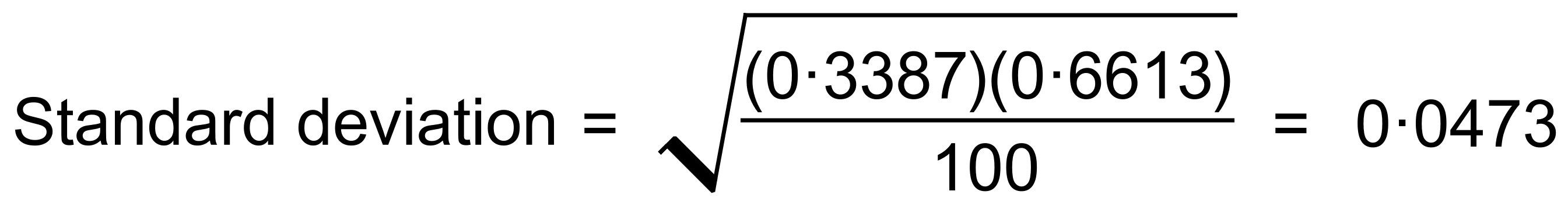
17. (a) Take proportions as follows:



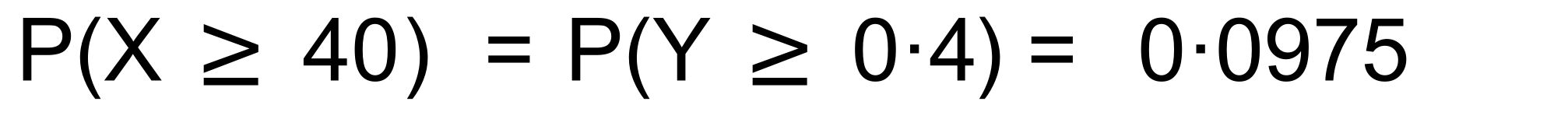
   ✓✓✓

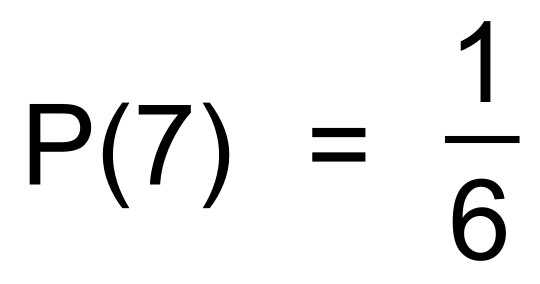
(b) (i) Normal distribution ✓

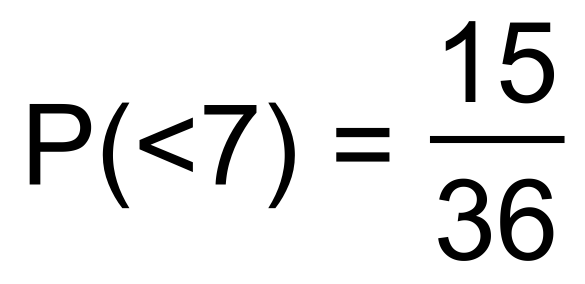
(ii)  ✓

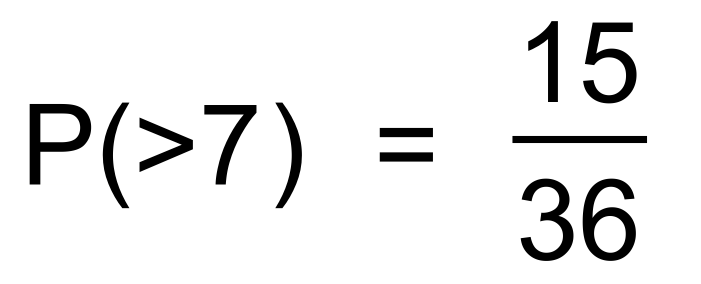
 ✓

(c)  ✓

∴  ✓✓ [9]

18. (a)  ✓

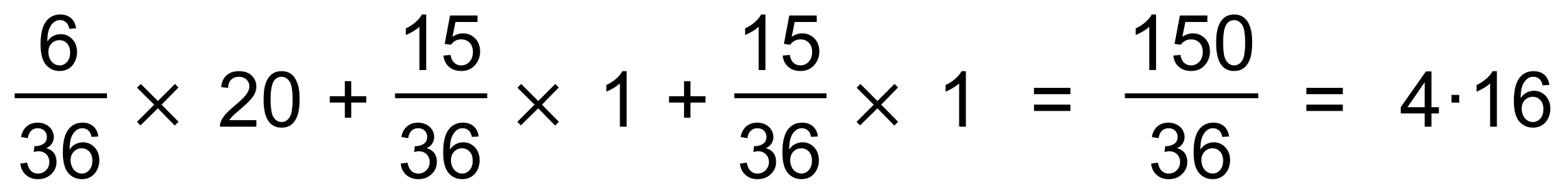
(b)  ✓

(c)  ✓

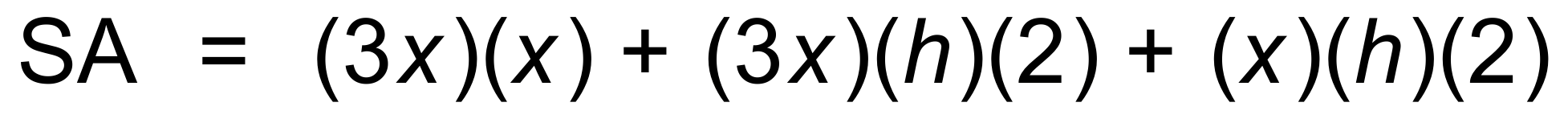
(d) $12 ✓

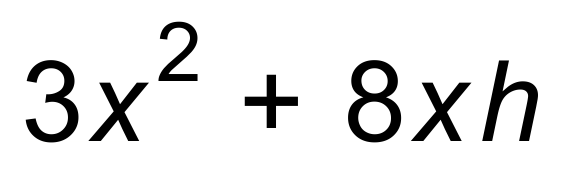
(e)

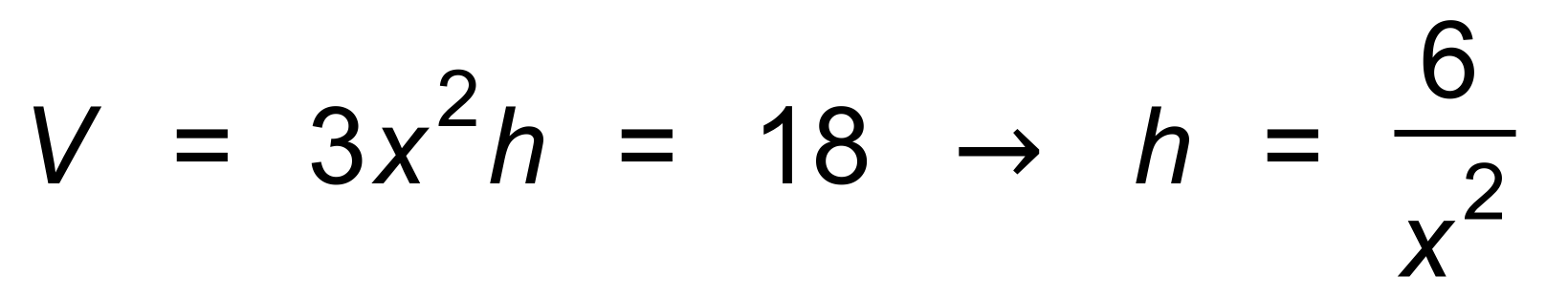
|  |  |  |  |
| --- | --- | --- | --- |
| Game | 7s | Unders | Overs |
| P(X) |  |  |  |
| Return | 20 | 1 | 1 |

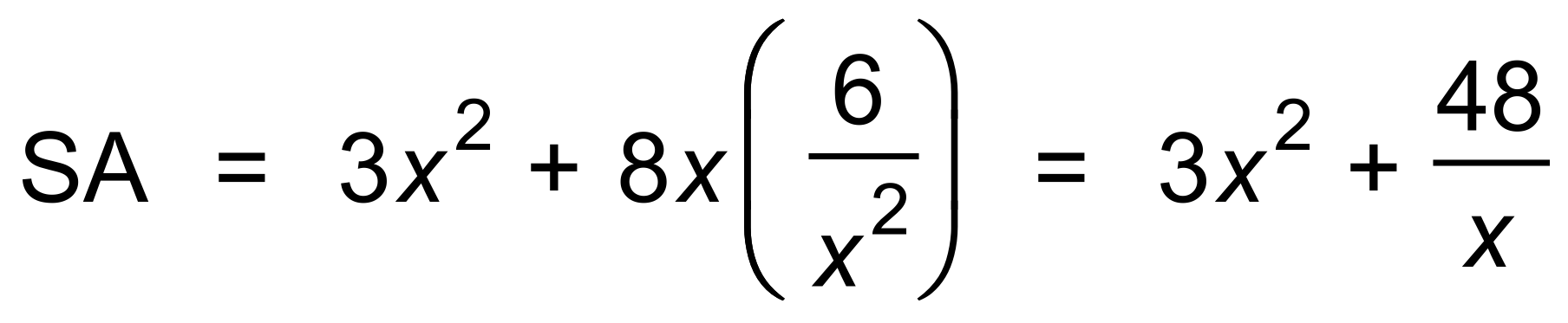
∴ E(X) =  ✓✓

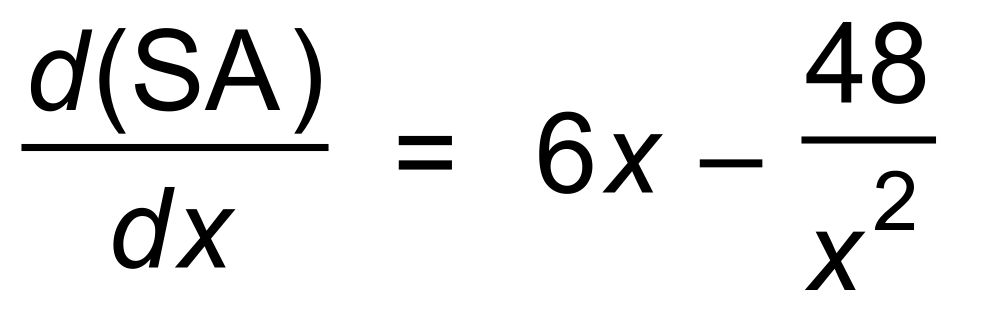
∴ Club makes $5 − $4.16 = 84 cents per roll ✓ [7]

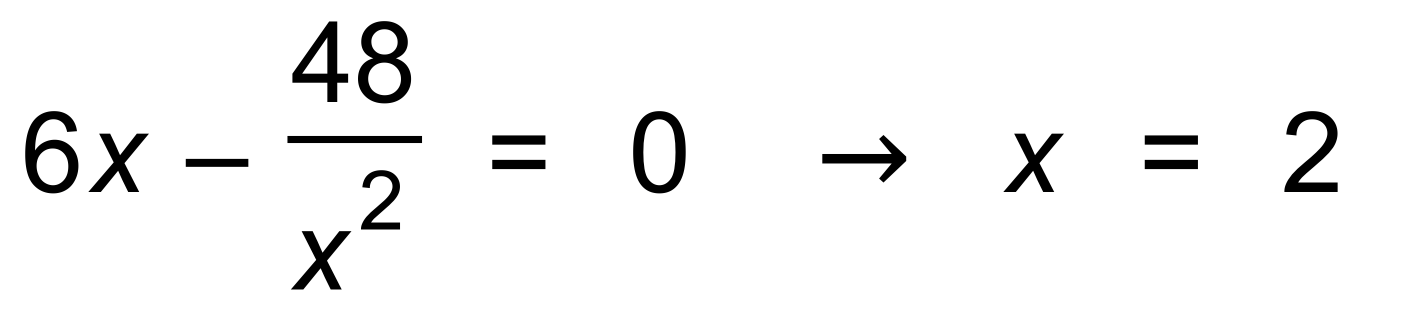
19. (a) 

=  ✓

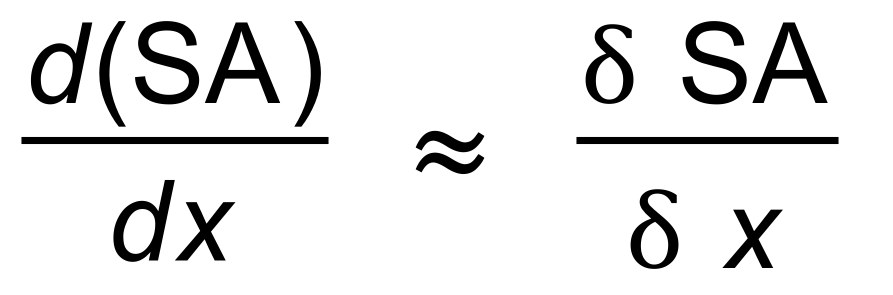
 ✓

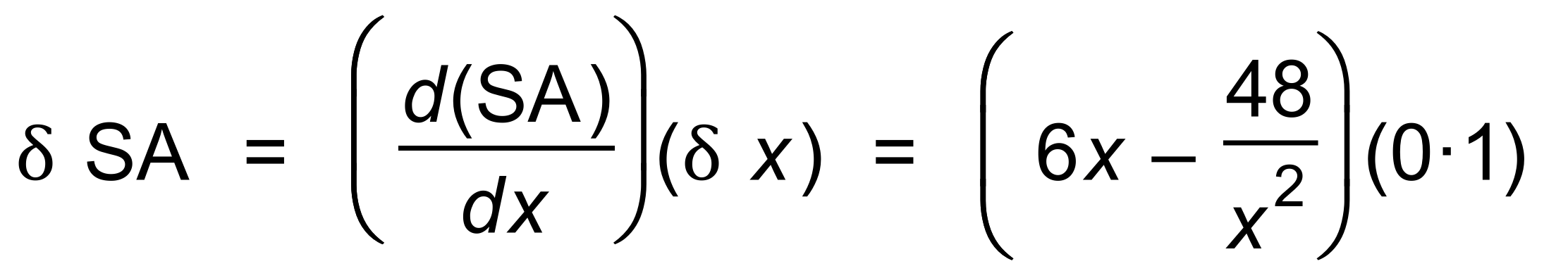
 ✓

(b)  ✓

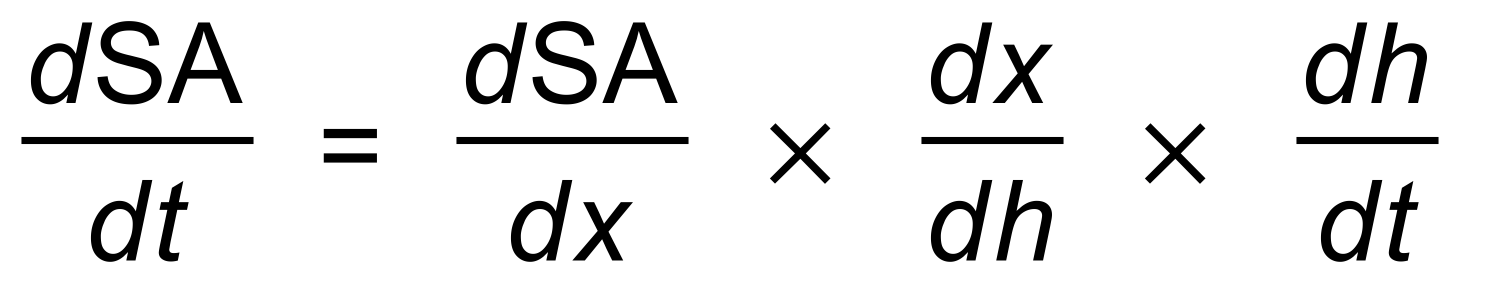
∴ Max occurs when  ✓

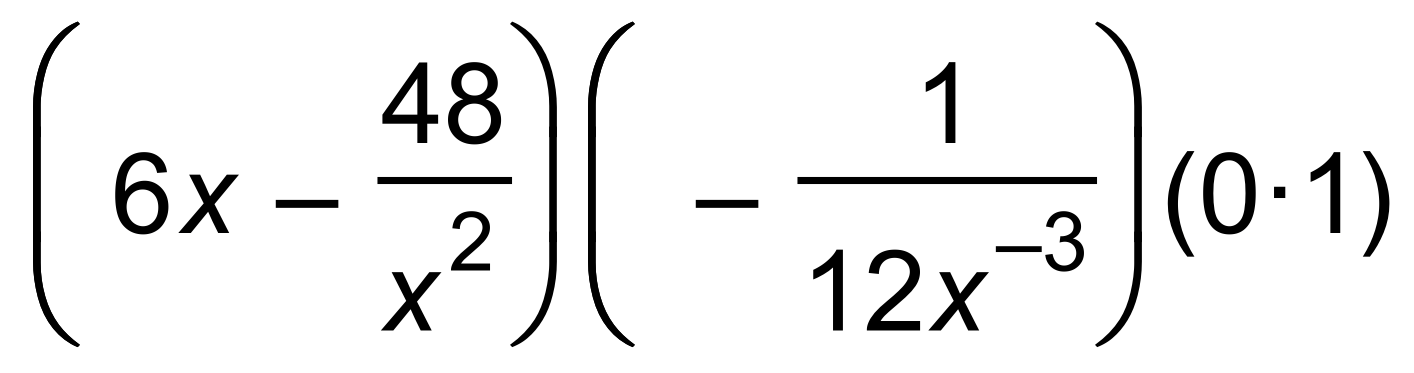
∴ *h* = 1.5 and SA = 36 m2 ✓

(c) 

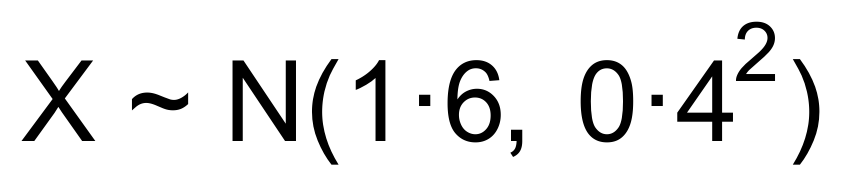
 ✓

 ✓

(d) 

=  ✓✓

When *x* = 1,  ✓ [11]

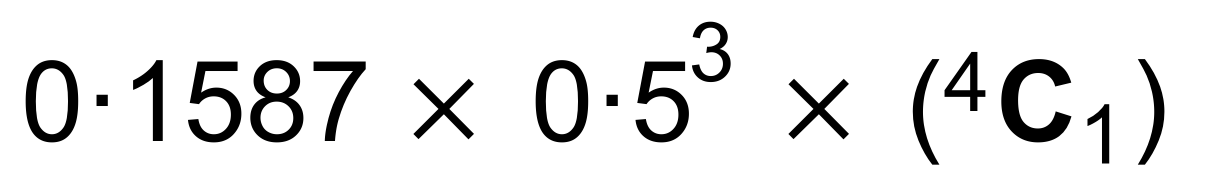
20. (a) 

P(X > 2) = 0.1587 ✓✓

(b)  ✓✓

(c) (i) X ~ Bin(4, 0.1587) ✓

∴ P(X = 1) = 0.378 ✓

(ii)  ✓

= 0.0794 ✓ [8]