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**SEMESTER TWO**

**MATHEMATICS**

**METHODS**

**UNITS 3 & 4**

**2020**

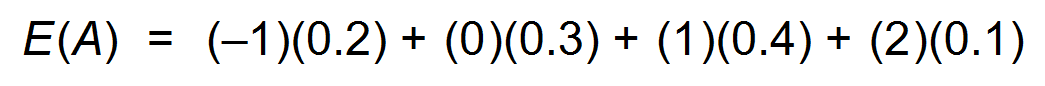
**SOLUTIONS**

**Calculator−free Solutions**

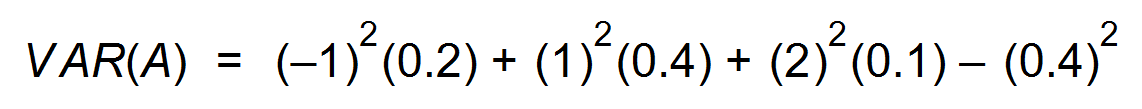
1. (a)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *a* | −1 | 0 | 1 | 2 |
| P(*A* = *a*) | 0.2 | 0.3 | 0.4 | 0.1 |

✓✓

(b)  ✓

= −0.2 + 0.4 + 0.2 = 0.4 or $400 ✓

(c)  ✓

= 0.2 + 0.4 + 0.4 − 0.16 ✓

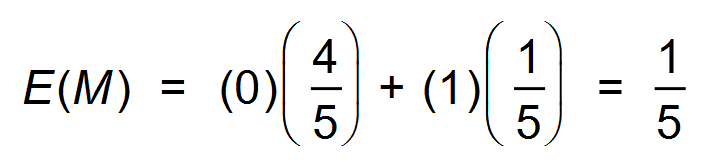
= 0.84 ✓ [7]

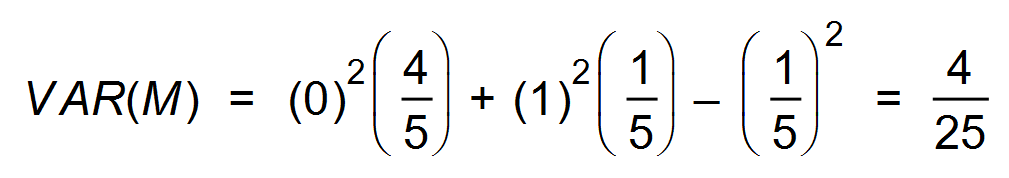
2. (a)

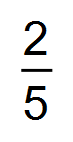
|  |  |  |
| --- | --- | --- |
| *m* | 0 | 1 |
| P(*M* = *m*) |  |  |

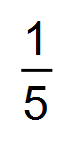
✓✓

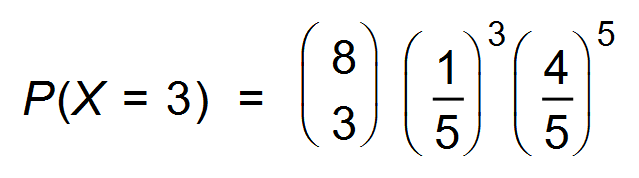
(b) It has two possibilities, independent events and is a DRV ✓

(c)  ✓

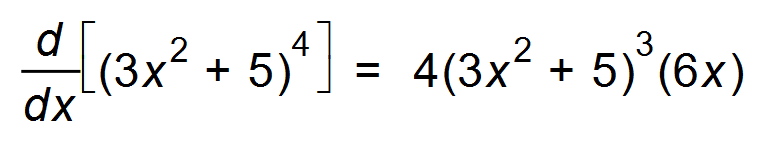


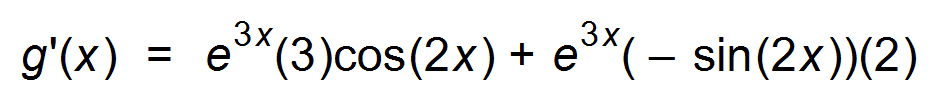
∴ SD =  ✓

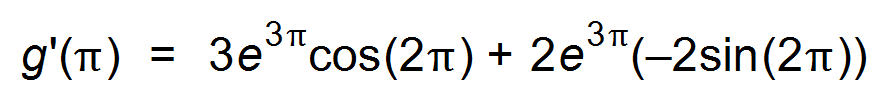
(d) X ~ B(8,) ✓

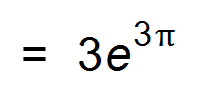
(e)  ✓ [7]

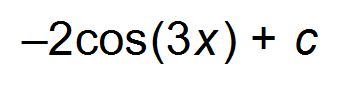


3. (a)  ✓✓

(b)  ✓

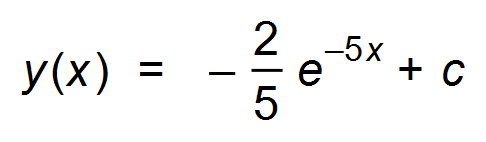
 ✓

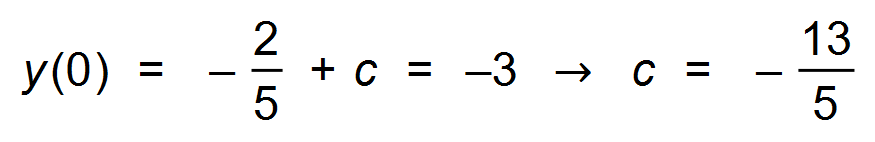
∴  ✓

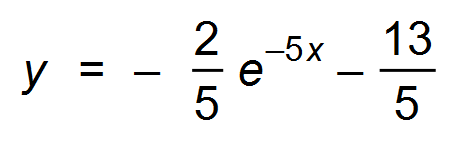
(c) (i)  ✓✓

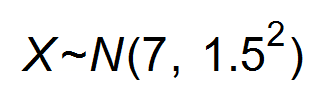
(ii) ✓

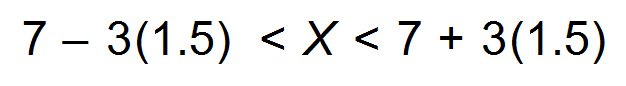
= ln (7) − ln(1) = ln 7 ✓

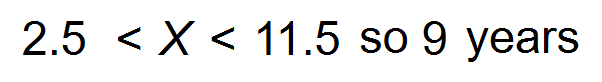
(d)  ✓

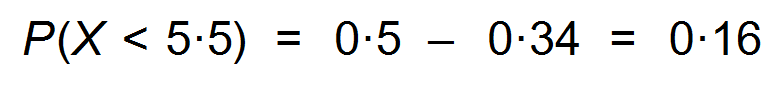
Since 

∴  ✓ [11]

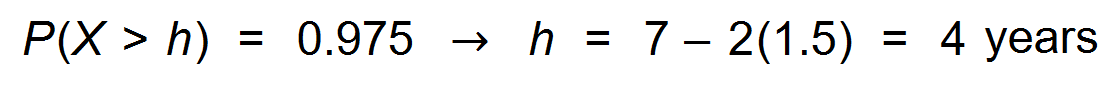
4. (a) 

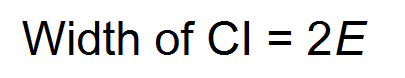
∴  ✓

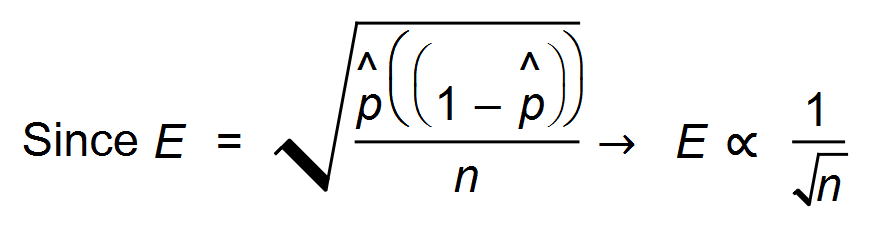
∴  ✓

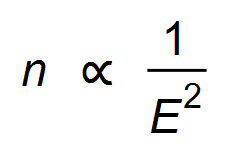
(b)  ✓

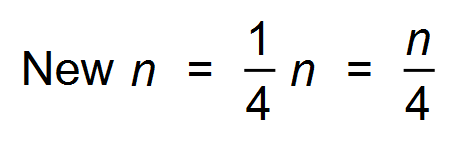
∴ 16% ✓

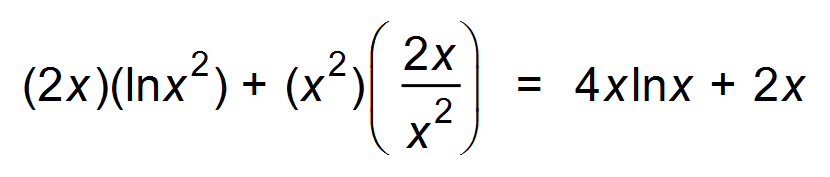
(c)  ✓✓ [6]

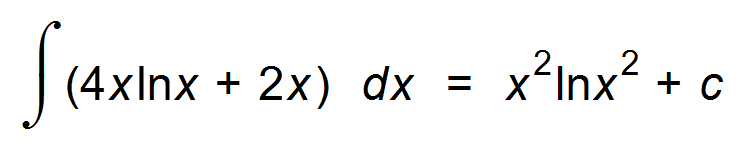
5. 

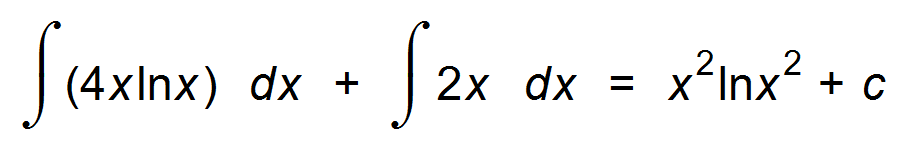
 ✓

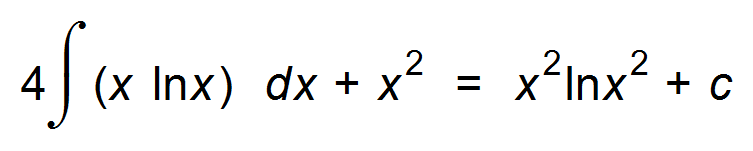
∴  ✓

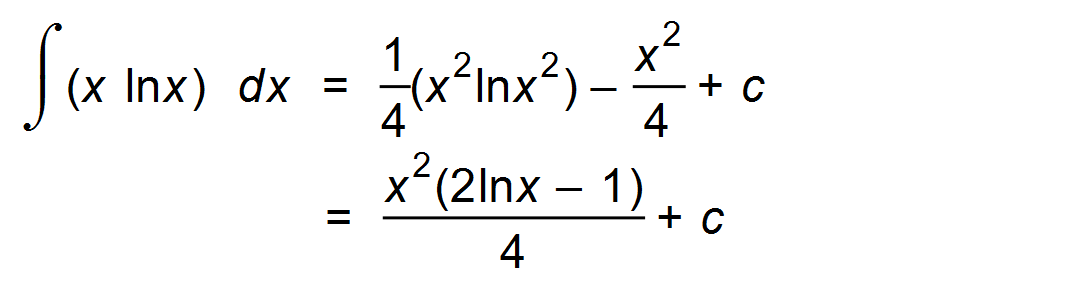
∴  ✓ [3]

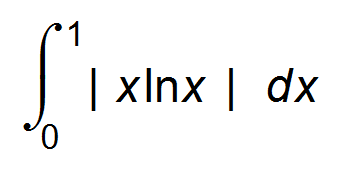
6. (a) (i)  ✓✓

(ii)  ✓

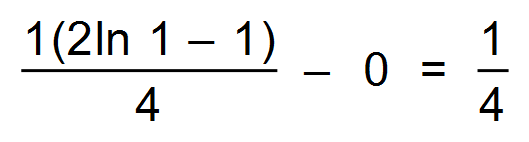
∴  ✓

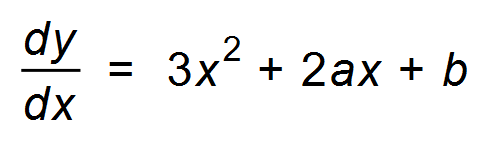
∴  ✓

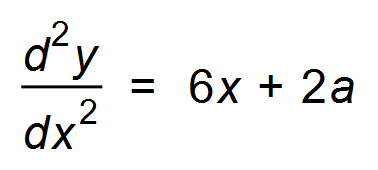
 ✓

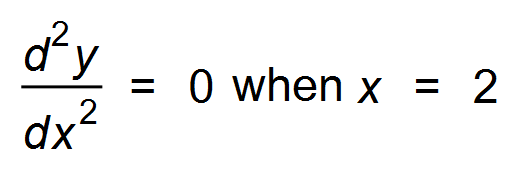
(b) Area =  ✓

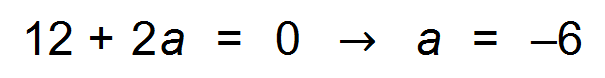
= − ✓

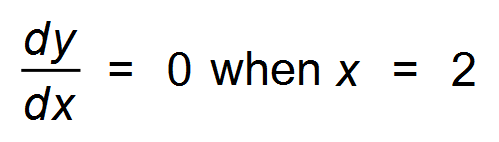
= − ✓✓ [10]

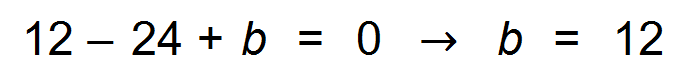
7.  ✓

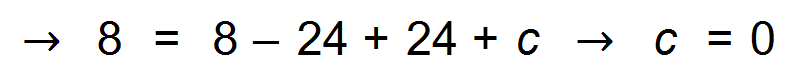
 ✓

Since HPOI  ✓

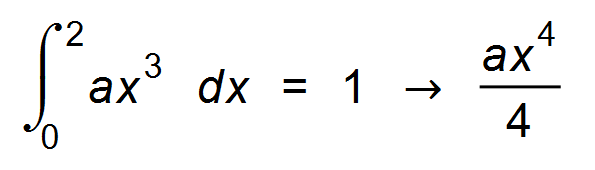
∴  ✓

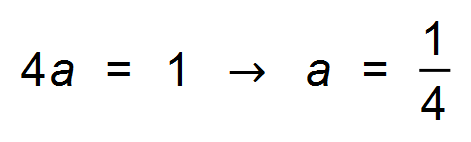
And 

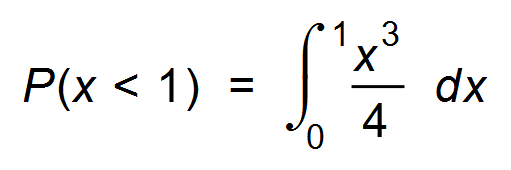
∴  ✓

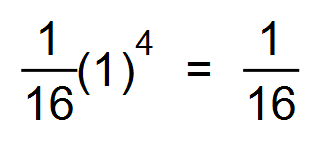
(2, 8)  ✓ [6]

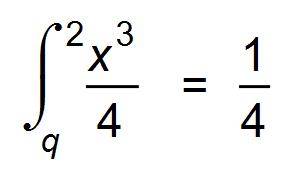
**Calculator−Assumed Solutions**

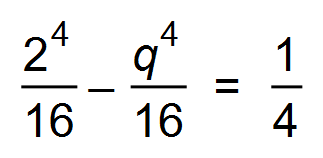
8. (a) ] = 1 ✓

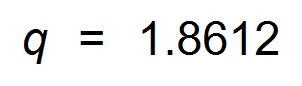
∴  ✓

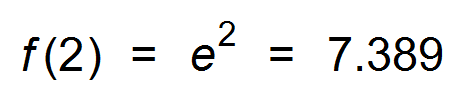
(b)   ✓

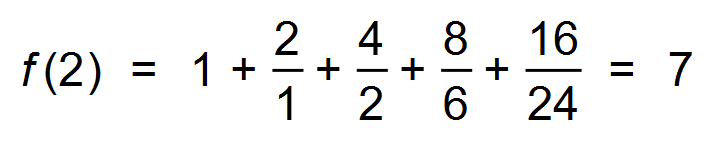
=  ✓

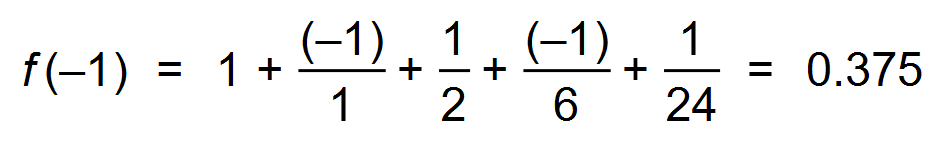
(c)  ✓

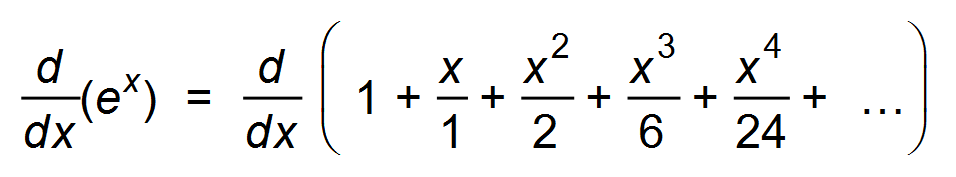
∴  ✓

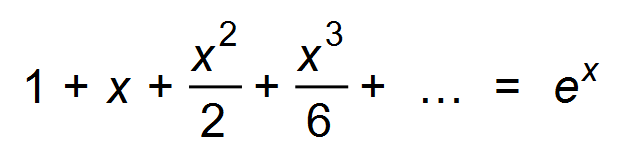
∴  ✓ [7]

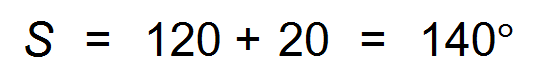
9. (a) (i)  ✓

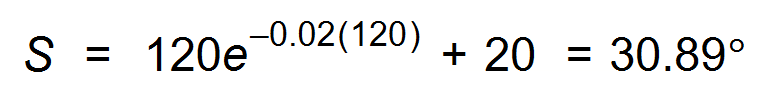
(ii)  ✓

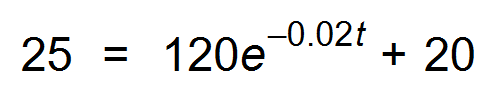
(b)  ✓✓

(c)  ✓

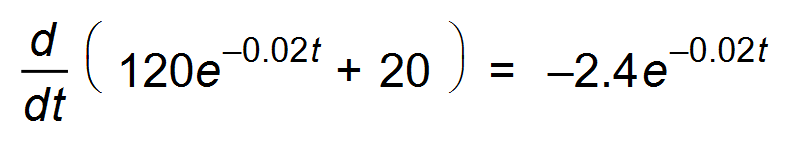
=  ✓ [6]

10. (a)  ✓

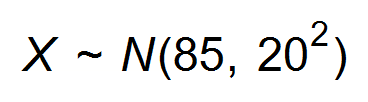
(b)  ✓✓

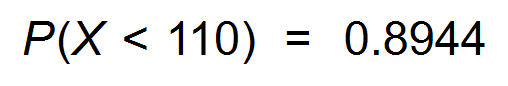
(c)  ✓

∴ *t* = 159 seconds ≈ 3 mins ✓✓

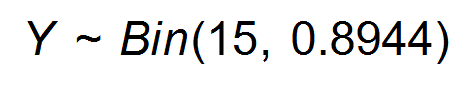
(d)  ✓

When *t* = 30, rate = −1.3°/sec ✓ [8]

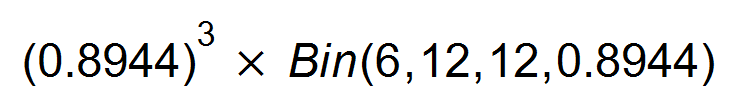
11. (a) 

 ✓

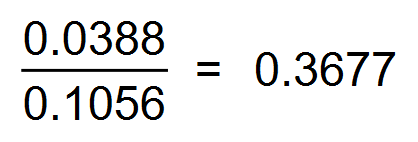
∴ 89.44% ✓

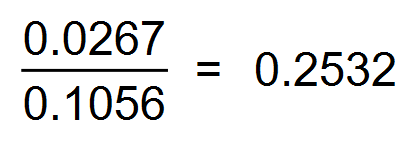
(b) 

(i) *P*(*Y* = 10) = 0.01292 ✓✓

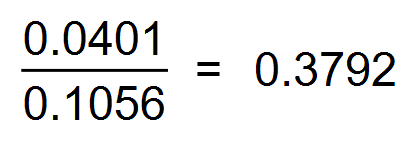
(ii)  ✓✓

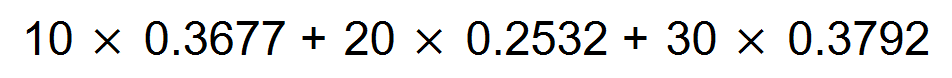
= 0.7154 ✓

(c) $10  ✓

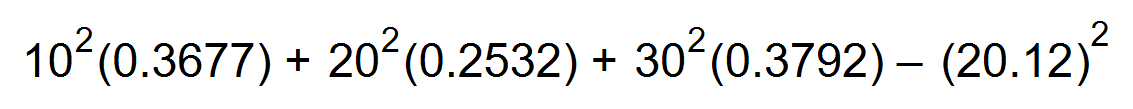
$20  ✓



$30  ✓

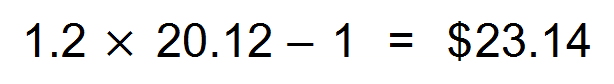
(d) E(Y) =  ✓

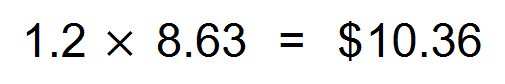
= $20.12 ✓

(e) VAR(Y) =  ✓

= 74.516 ✓

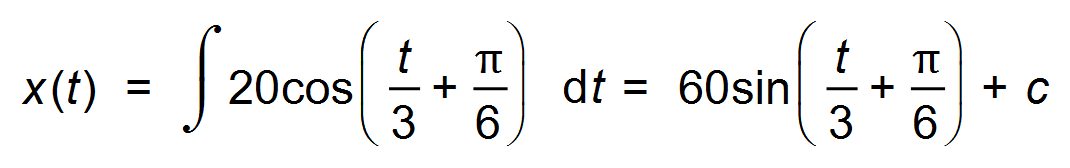
St. Dev. = 8.63 ✓

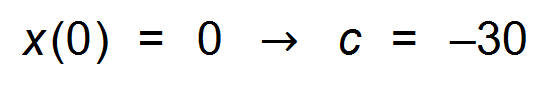
(f) New Mean =  ✓

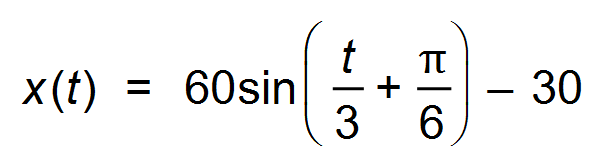
New St. Dev. =  ✓ [17]

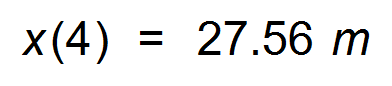
12. (a) (i) 17.32 m/min ✓

(ii) 20 m/min ✓

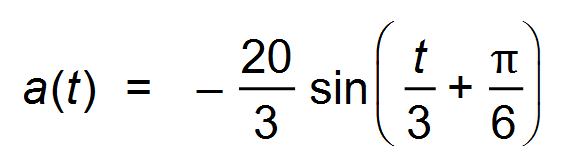
(b)  ✓

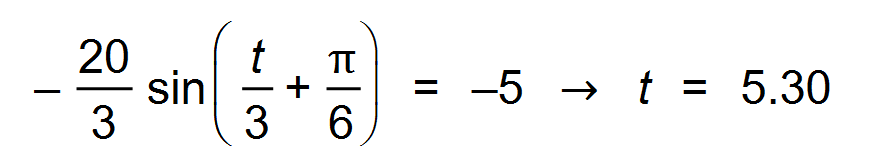
 ✓

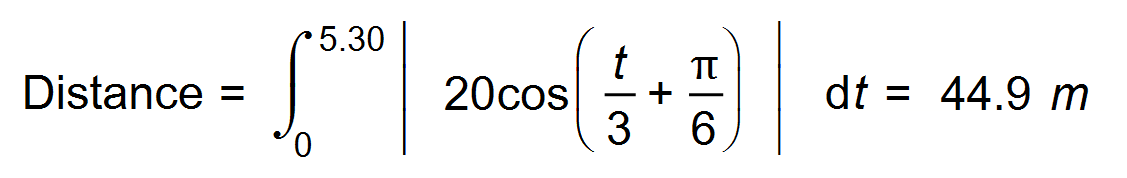
∴  ✓

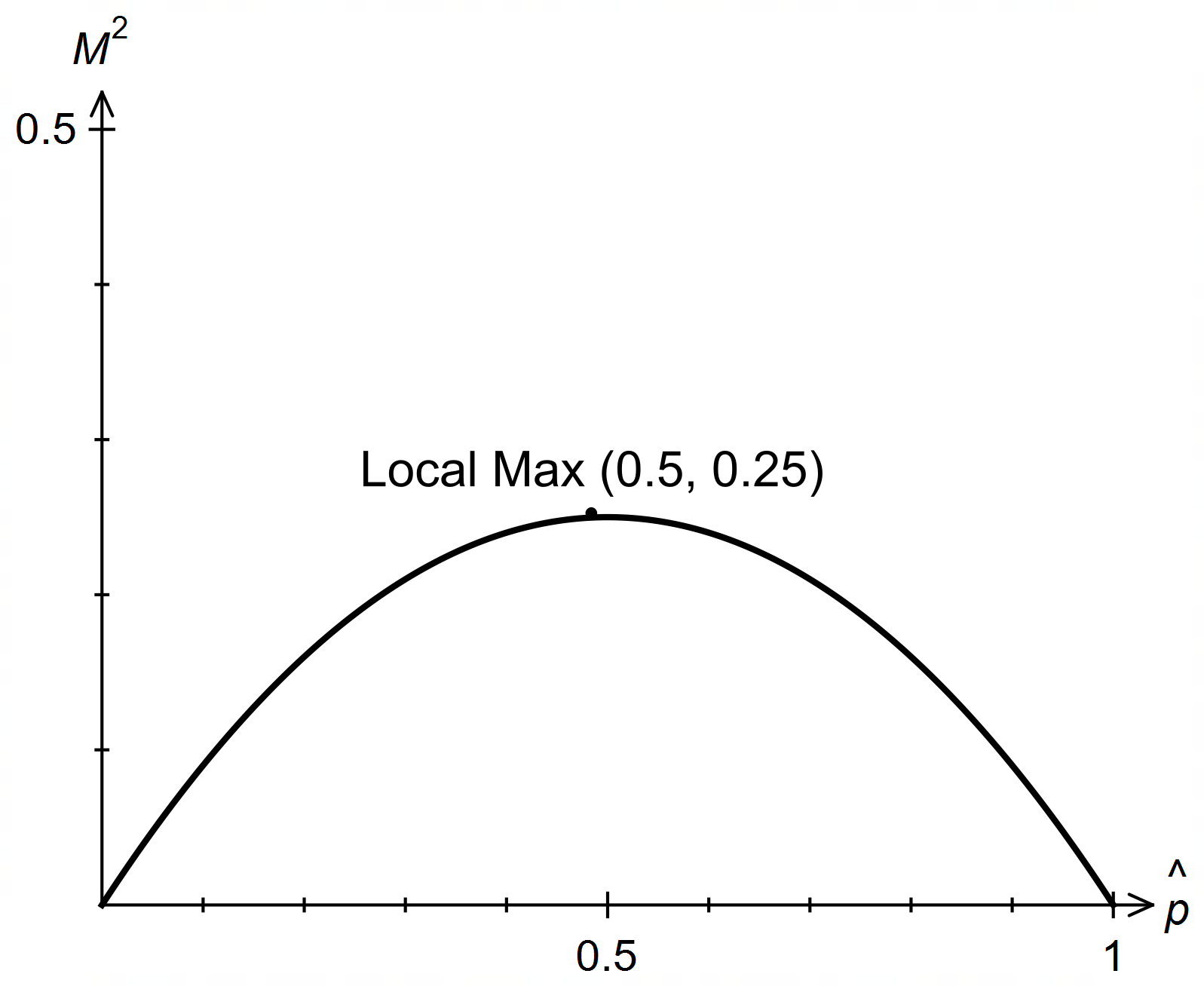
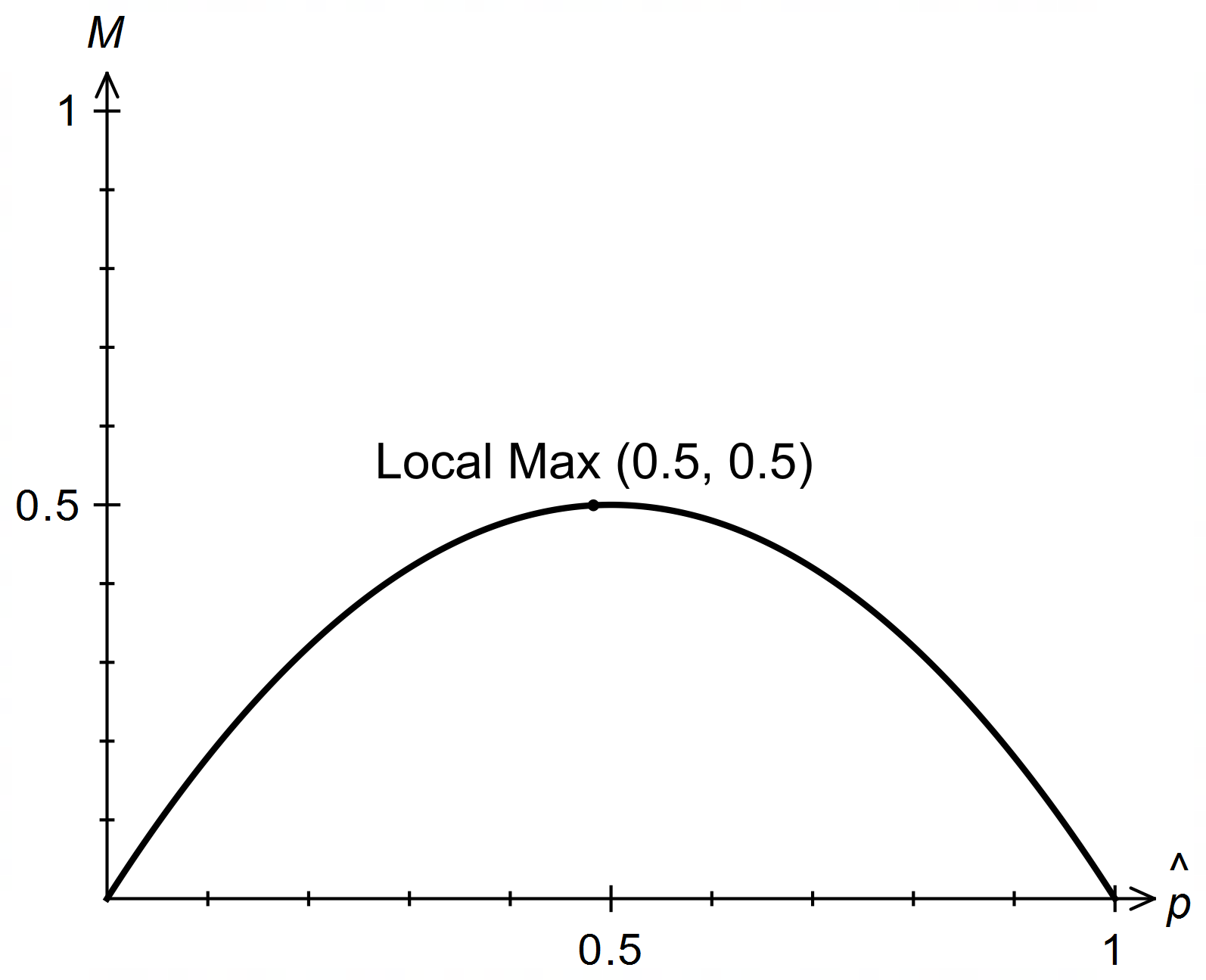
(c) (i)  ✓

(ii)  ✓

(d)  ✓

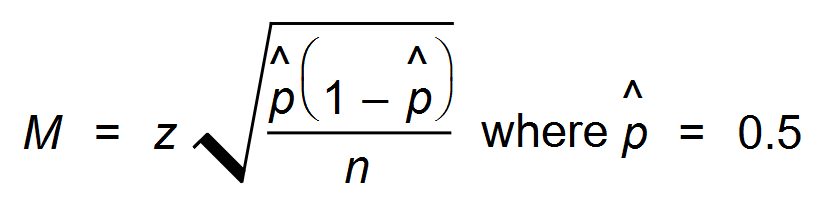
∴  ✓

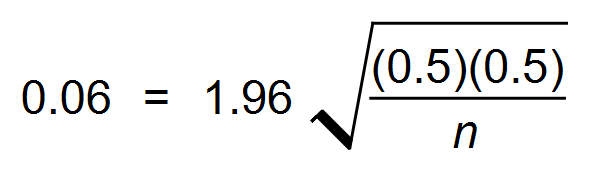
∴  ✓ [10]

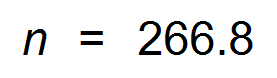
13. (a)

**OR**

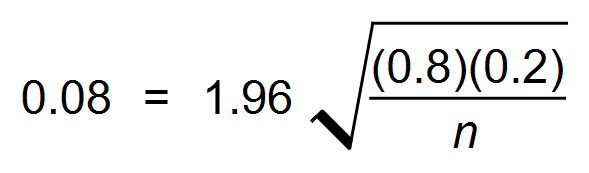
✓✓

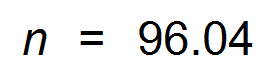
(b) 

∴  ✓✓

∴  ✓

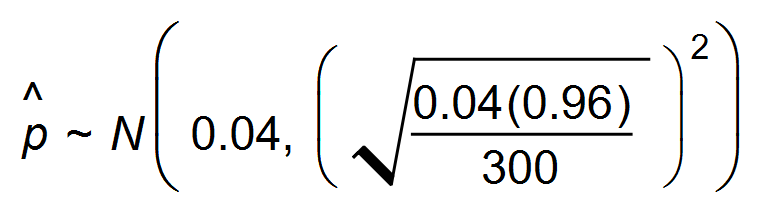
Hence 267 trainers should be tested ✓

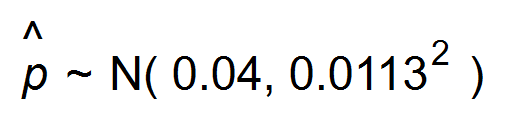
(c)  ✓✓

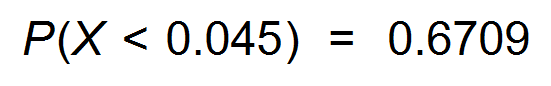
∴  ✓

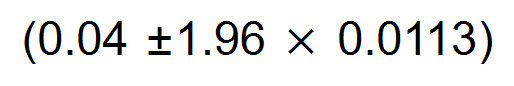
∴ 96 x 0.8 = 76.8

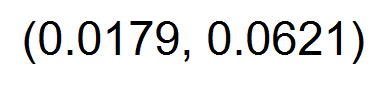
Hence 76 or 77 trainers would be qualified. ✓ [10]

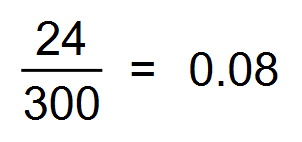
14. (a)  ✓✓

i.e.  ✓

(b)  ✓✓

(c)  ✓✓

∴  ✓

(d)  ✓

Since 0.08 is not in the 95% CI ✓

it would be unlikely to happen. ✓

(e) (i) *n* should be larger ✓

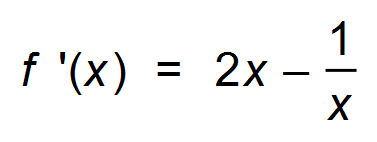
Since the formula for standard error has *n* in the denominator,

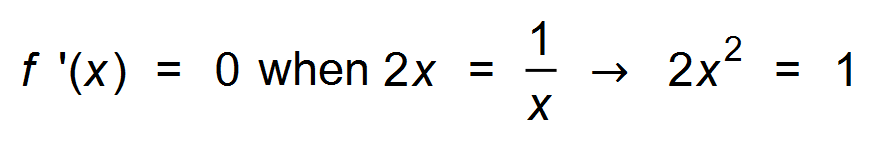
increasing n will decrease the standard error. ✓

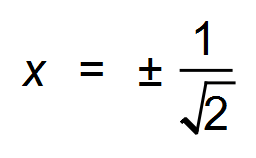
(ii) From the standard normal distn, P (−*k* < *p* < *k*) = 0.98 ✓

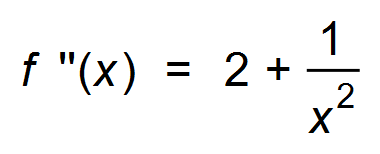
*k* = 2.326 ✓ [15]

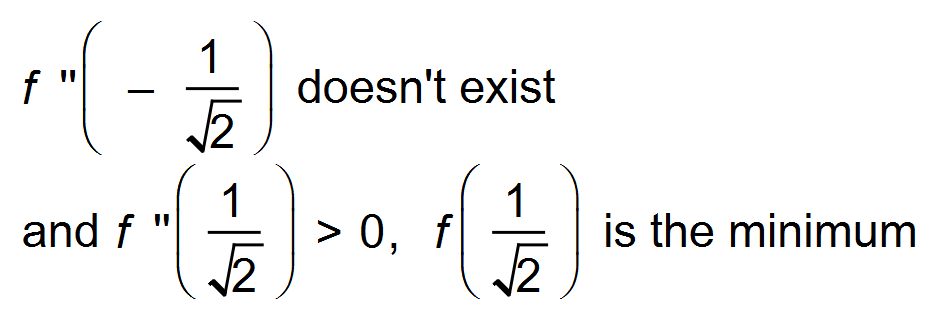
15. (a) ln 0 doesn’t exist. ✓

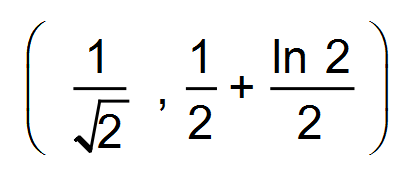
(b)  ✓

 ✓

∴  ✓

 ✓

Since 

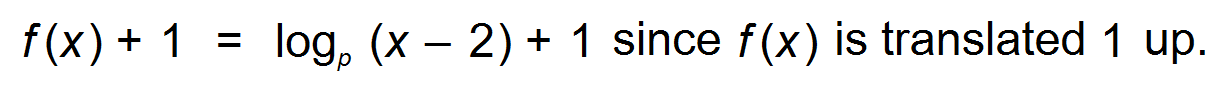
∴  is the minimum point. ✓ [6]

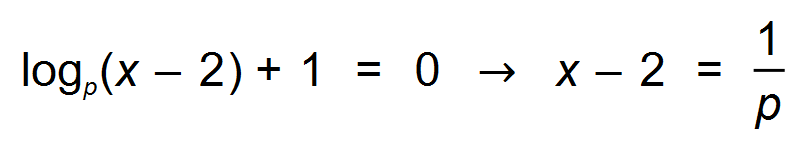
16. (a) (i) *x* = 2 ✓

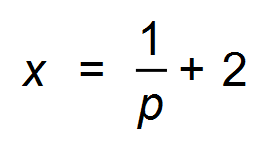
(ii) *a* = 2 ✓

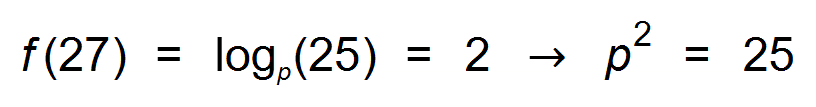
(iii) We require another set of co−ordinates, as

log*p* 1 = 0 for all *p*. ✓

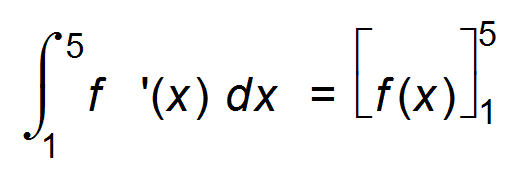
(b)  ✓

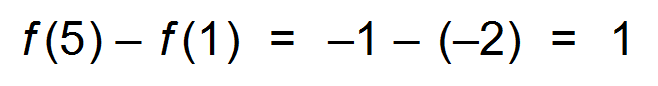
∴  ✓

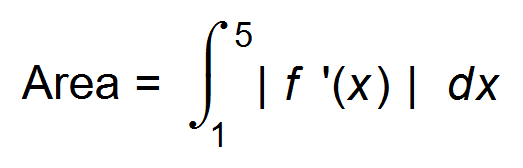
∴  ✓

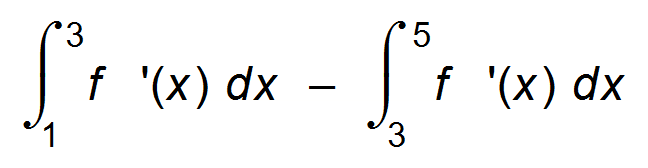
(c)  ✓

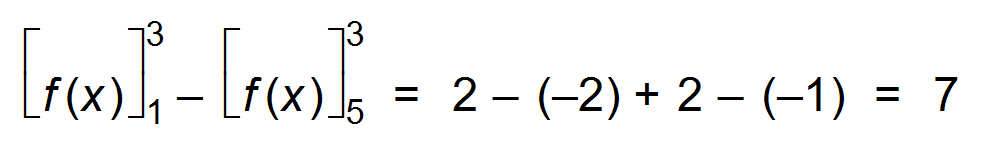
∴ *p* = 5 ✓ [8]

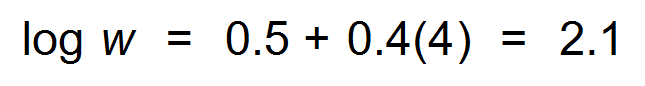
17. (a)  ✓

=  ✓

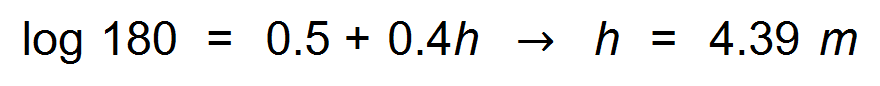
(b)  ✓

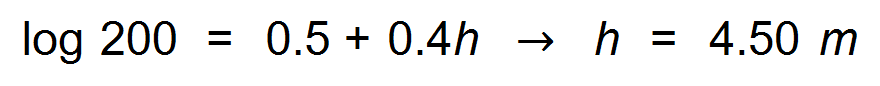
=  ✓

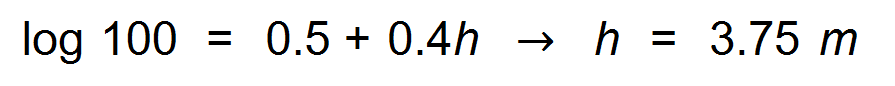
=  ✓✓ [6]

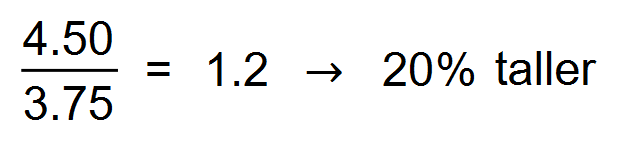
18. (a)  ✓

∴ w = 125.9 *kg* ✓

(b)  ✓✓

(c)  ✓

 ✓

∴  ✓ [7]