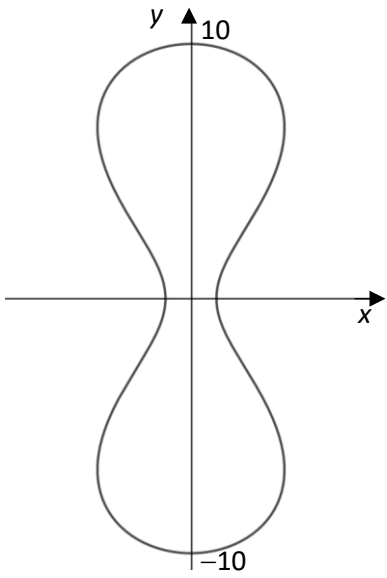


2020 H2 Math Prelim Paper 2 Marking Scheme

Q	Solution	Marks Allocation
1(i)	$\frac{d}{dx} \tan(x^3) = 3x^2 \sec^2(x^3)$	
(ii)	$2x^3 \tan(x^3) - 2 \ln \sec(x^3) + c$	

2(a)	$z = -2$	
2(b)(i)	<p>Method 1:</p> $z = e^{i\frac{\pi}{2}};$ $w = e^{-i\frac{\pi}{4}}$	
2(b)(ii)	<p>$OACB$ is a rhombus.</p>	
2(b)(iii)		

3(i)	 <p>Equations of lines of symmetry : $y=0$ and $x=0$.</p>	
(ii)	$\theta = \frac{\pi}{2}$ or $\frac{3\pi}{2}$	
(iii)		
(iv)	33π	
4 (i)	$2x - y + z = 5$	
(ii)	$\mathbf{r} = \begin{pmatrix} 3 \\ 1 \\ 0 \end{pmatrix} + t \begin{pmatrix} 1 \\ 0 \\ -2 \end{pmatrix}, \quad t \in \mathbb{R}$	
(iii)	<p>Square of the distance AD</p> $= \left \vec{AD} \right ^2 = 5t^2 + 12t + 12$ $\left(\frac{9}{5}, 1, \frac{12}{5} \right).$	
(iv)	$k = -2$ or $k = \frac{22}{5}$	

5(i)	No of ways = $(7-1)! \times 2!$ = 1440	
(ii)	No of ways = $(5-1)! \times {}^5P_3 \times 8$ or $(5-1) \times (5 \times 4 \times 3) \times 8$ = 11520	
(iii)	Method 1 No. of ways without restriction = ${}^8C_3 \times 3!$ or $8 \times 7 \times 6$ = 336 No. of ways when couple is selected = ${}^6C_1 \times 3! = 36$ Required no. of ways = $336 - 36 = 300$	
(6) (i)	$P(A A \cup B) = \frac{3}{7}$	
(ii)	$P(B) = \frac{4}{9}$	
(iii)	$\frac{1}{3} \leq P(B) \leq \frac{7}{12}, P(B) \neq \frac{4}{9}$	

7						
(i)						
(ii)	x	0	1	2	3	
	$P(X=x)$	$\frac{1}{10}$	$\frac{14}{45}$	$\frac{3}{10}$	$\frac{13}{45}$	
(iii)	$P(X_1 - X_2 \geq 1) = \frac{583}{810}$					
(iv)	≈ 0.941					

8 (i)	The probability that a surgical mask is defective is constant at 0.15 in a randomly chosen box. Whether a randomly chosen surgical mask is defective or not is independent of any other surgical mask.	
(ii)	0.332 (3 s.f)	
(iii)	0.909	
(iv)	0.997	
(v)	$\therefore \frac{1}{11} < p < \frac{2}{11}$	
9 (i)	$\mu = 120$ $\sigma = 6.00$ (3 s.f.)	
(ii)	0.123 (3 s.f.)	
(iii)	Least value of $n = 27$	
(iv)	0.687 (3 s.f.)	

10 (i)	An unbiased estimate of μ is $\bar{x} = 616.25$ An unbiased estimate of σ^2 is $s^2 = 450$ (3 s.f)	
(ii)	p -value $\approx 0.0569 > 0.05$	
(iii)	“5% level of significance” means that there is a probability of 0.05 that the test will indicate that mean tensile strength of the reinforcing bar is less than 620 MPa when it is at least 620 MPa.	
(iv)	We need to assume that the distribution of the tensile strengths of the reinforcing bars is normal.	

(v)	Range of population variance = $\{\sigma^2 \in \mathbb{R}^+ : \sigma^2 \leq 206\}$	
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