2019 VCE Specialist Mathematics 2 (NHT) examination report

Specific information

This report provides sample answers or an indication of what answers may have included. Unless otherwise stated, these are not intended to be exemplary or complete responses.

Section A – Multiple-choice questions

Question	Answer
1	B
2	E
3	D
4	B
5	A
6	C
7	E
8	D
9	D
10	D
11	C
12	B
13	E
14	C
15	C
16	E
17	A
18	A
19	D
20	B

Section B

Question 1a.

Substitute $z = 0 + 0i$

$\text{LHS} = |2| = 2$

$\text{RHS} = \left|-1 - \sqrt{3}i\right| = \sqrt{(-1)^2 + \left(-\sqrt{3}\right)^2} = \sqrt{4} = 2$

Appropriate working was required to verify the given result.

Question 1b.

$|x + iy + 2| = \left|x + iy - 1 - \sqrt{3}i\right|$

$(x+2)^2 + y^2 = (x-1)^2 + \left(y - \sqrt{3}\right)^2$

$x^2 + 4x + 4 + y^2 = x^2 - 2x + 1 + y^2 - 2\sqrt{3}y + 3$

$6x = -2\sqrt{3}y$

$3x = -\sqrt{3}y$

$y = -\sqrt{3}x$

Alternatively, a perpendicular bisector approach with appropriate working could have been used.

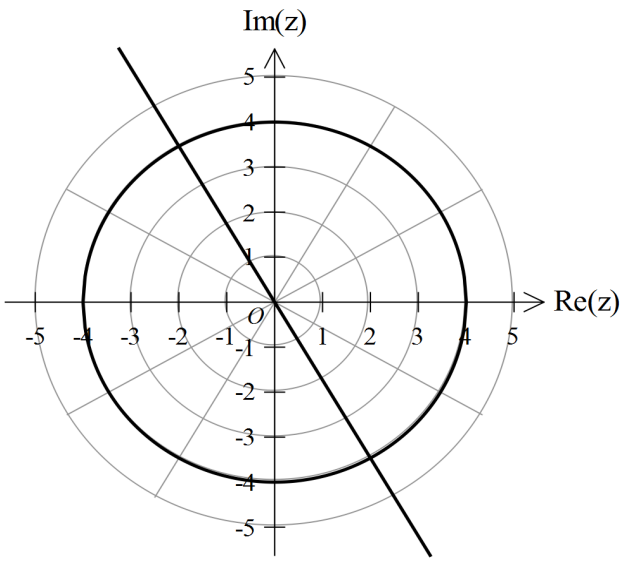
Question 1c.

$z_1 = -\frac{1}{2} - \frac{i\sqrt{3}}{2}$

Question 1d.

$\left(2, -2\sqrt{3}\right)$ and $\left(-2, 2\sqrt{3}\right)$

Question 1e.



Question 1f.

$$\frac{20\pi}{3}$$

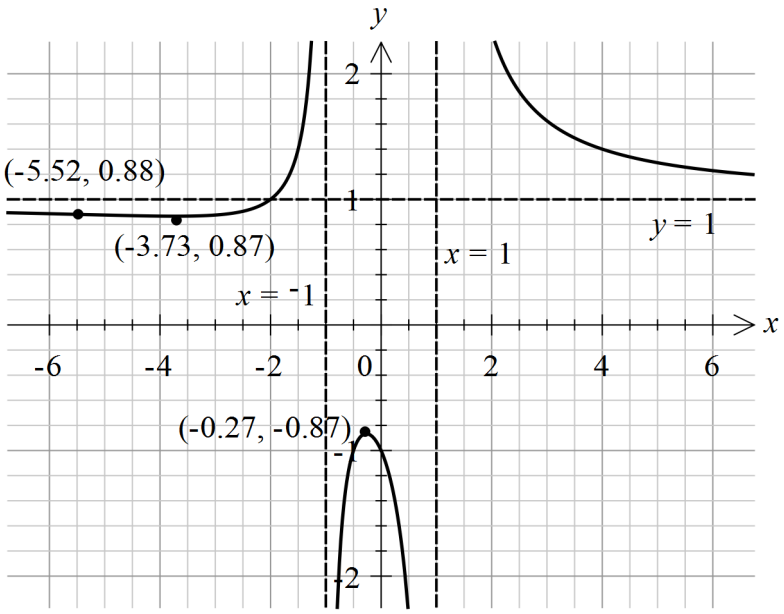
Question 2ai.

$x = -1,\ x = 1,\ y = 1$

Question 2aii.

Stationary points: $(-3.73, 0.87)$, $(-0.27, -0.87)$, Point of inflection: $(-5.52, 0.88)$

Question 2aiii.



Question 2b.

$-2 \le k \le 0$

Note that the endpoints are included as the resulting forms of $f_k(x)$ do not have a stationary point when *k* takes those values.

Question 2c.

$k = -1$

Question 3ai.

$V = \pi \int x^2 dy$

$\frac{x^2}{80} = y + \frac{45}{4}$

$x^2 = 80y + 900$

$V = \pi \int_0^{50} (900 + 80y)\, dy$

Appropriate working showing formulation was required.

Question 3aii.

$145\ 000\pi$

Question 3b.

$A = \pi x^2 = \pi(900 + 80h), \frac{dV}{dt} = \frac{-8000\pi\sqrt{h}}{\pi(900 + 80h)} = \frac{-400\sqrt{h}}{45 + 4h}$

Appropriate working leading to the given result was required.

Question 3c.

$\frac{-20\sqrt{h}}{\pi(45 + 4h)^2}$

Question 3d.

$\int_{50}^{0} \frac{-\pi(45 + 4h)^2}{20\sqrt{h}}\, dh = 9.9$

Question 4a.

60°

Question 4b.

12

Question 4c.

5.5

Question 4d.

Curve intersects with $y = -x$

$6\sqrt{3}t - 4.9t^2 + 0.01t^3 = -(6t - 0.01t^3)$

$6\sqrt{3}t - 4.9t^2 + 6t = 0$

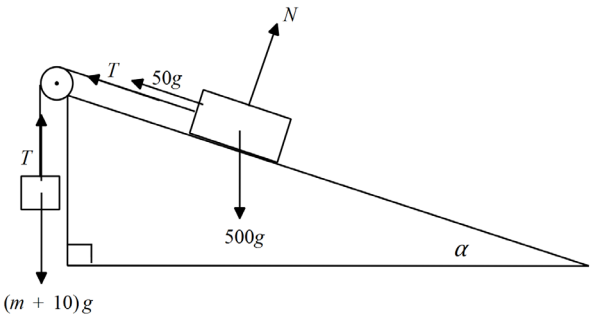
$t = \frac{6(1 + \sqrt{3})}{4.9} = \frac{60(1 + \sqrt{3})}{49}$

Appropriate working leading to the given result was required.

Question 4e.

38.51

Question 5a.



Question 5b.

$T-(m+10)g=0, 500g\times\sin\alpha-T-50g=0$

(Alternatively, set up a single equation of motion 'along the cable'.)

$\sin\alpha=\frac{7}{25}$

$500g\times\frac{7}{25}-(m+10)g-50g=0$

$140-(m+10)-50=0$

$m=80$

Appropriate working leading to the given result was required.

Question 5c.

$\frac{25g}{9}\left(\frac{245}{29}\right)$

Question 5di.

$80+2t$

Question 5dii.

$T-80g=80a, 140g-T-50g=500a$

$10g-2gt=(580+2t)a$

$a=\frac{10g-2gt}{580+2t}=\frac{g(5-t)}{t+290}$

Question 5diii.

3.4

Question 6a.

Mean 3.55, standard deviation 0.11

Question 6b.

$H_0 : \mu = 3.55$, $H_1 : \mu > 3.55$

Question 6c.

$p = \Pr\left(\overline{X} > 3.85 \mid \mu = 3.55\right) = 0.003$

Question 6d.

As $p < 0.01$, reject H_0 (at the 1% level)

Question 6e.

$\Pr\left(\overline{X} > \overline{x}_{\text{critical}} \mid \mu = 3.55\right) = 0.01$, $\overline{x}_{\text{critical}} = 3.806$

$\overline{x} \geq 3.806$

$\Pr\left(\overline{X} < 3.806 \mid \mu = 3.83\right) = 0.41$