VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

# 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.

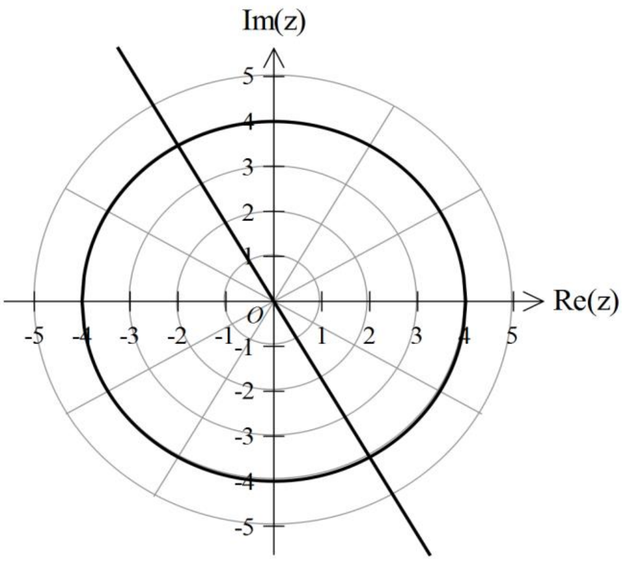
**Question 1c.**

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

**Question 1d.**

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

**Question 1e.**




**Question 1f.**

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

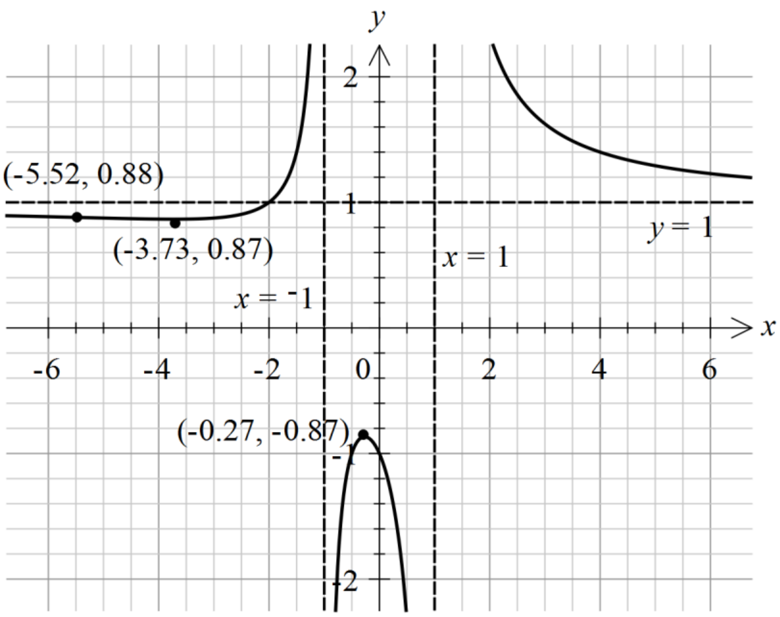
**Question 2ai.**

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

**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.**

$60^\circ$

**Question 4b.**

$12$

**Question 4c.**

$5.5$

**Question 4d.**

Curve intersects with $y = -x$

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

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

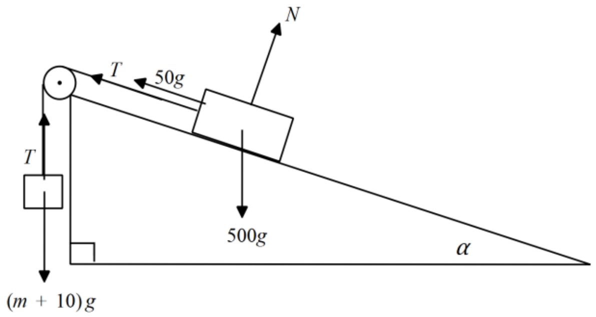
$t = \frac{6(1 + \sqrt{3})}{4.9} = \frac{60(1 + \sqrt{3})}{49}$

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'.)

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

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

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

$m=80$

Appropriate working leading to the given result was required.

**Question 5c.**

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

**Question 5di.**

$80+2t$

**Question 5dii.**

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

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

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

**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.**

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

**Question 6d.**

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

**Question 6e.**

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

$\bar{x} \geq 3.806$

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