

m1901q1s

Write your SID here →

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THE UNIVERSITY OF SYDNEY

**School of Mathematics
and Statistics**

MATH1901 DIFFERENTIAL
CALCULUS (ADV)

SAMPLE QUIZ 1

Family Name :

Other Names :

Day/Time/Room :

Signature :

Time allowed: 40 minutes. Write your answers in the boxes provided. Each answer box is worth 1 mark. Non-programmable calculators may be used. Use the blank spaces provided for rough working, if necessary. Rough working will not be marked. Use a pen, not a pencil. All pages must be handed in at the end of the quiz. Please switch off mobile phones.

The actual quiz will resemble this sample quiz, but not necessarily cover the same topics.

1. Find the limit $M = \lim_{x \rightarrow 3} \frac{x^2 + 2x - 15}{x^2 - 9}$.

Answer

$M =$

2. Find the one-sided limit $C = \lim_{\theta \rightarrow 0^-} \frac{\sin 3\theta}{5\theta}$

Answer

$C =$

3. Express the product $(\sqrt{3} - i)^2(1 + i)^3$ as a complex number in polar form $r \operatorname{cis} \theta$, with $-\pi < \theta \leq \pi$.

Answer

$r \operatorname{cis} \theta =$

4. What is the natural domain D of the function $f : D \rightarrow \mathbf{R}$, $x \mapsto \ln(x/3) + \sin^{-1}(5x/2)$? (Express your answer in interval notation.)

Answer

$D =$

5. The discontinuity at $x = 3$ of the function $g(x) = (\sin \pi x)/(x - 3)$ is
- (a) a jump discontinuity,
 - (b) a removable discontinuity,
 - (c) an infinite discontinuity,
 - (d) none of the above.

Answer (a), (b), (c) or (d)

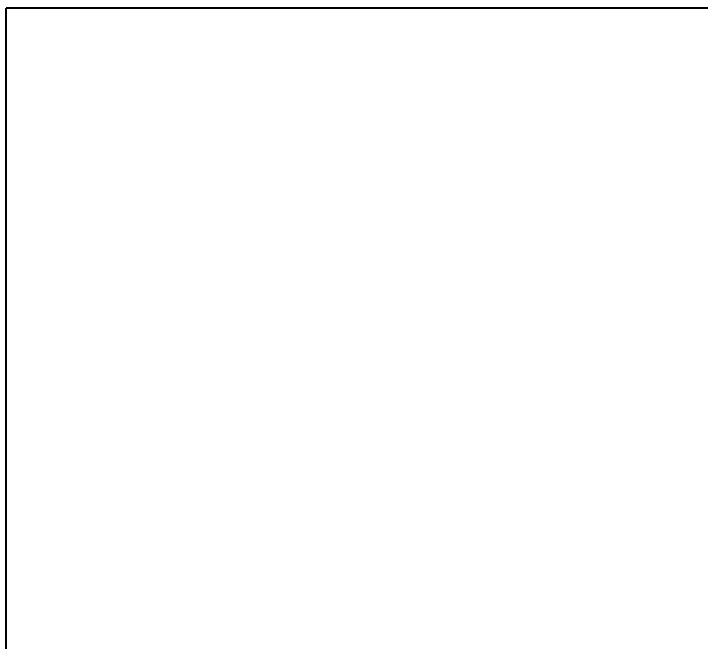
6. Calculate the inverse function $f^{-1}(x)$, where $f : [0, \infty) \rightarrow [\ln 4, \infty)$, $x \mapsto \ln(x^2 + 4)$.

Answer

$$f^{-1}(x) =$$

7. Sketch the region in the complex plane that is governed by the inequality $|z - 3 - 4i| \leq 2$.

Answer



8. The polynomial $P(x) = 2x^3 - x^2 - 26x - 45$ has a root on which one of the following intervals? (Use the Intermediate Value Theorem.)
 (a) $[4, 5)$, (b) $[3, 4)$, (c) $[2, 3)$, (d) $[1, 2)$.

Answer (a), (b), (c) or (d)

9. [2 marks] Solve the quadratic equation $z^2 - (2 + 3i)z - 8 - 6i = 0$, given that one of its two roots is real.

Answer 1 (the real root)

$z_1 =$

Answer 2 (the non-real root)

$z_2 =$

Answers:

1. $M = 4/3$ 2. $C = 3/5$ 3. $r \operatorname{cis} \theta = 8\sqrt{2} \operatorname{cis}(5\pi/12)$ 4. $D = (0, 2/5]$ 5. (b)
 6. $f^{-1}(x) = \sqrt{e^x - 4}$ 7. Closed disc in first quadrant, centre $3 + 4i$, radius 2 8. (a)
 9. [2 marks] $z_1 = -2$ and $z_2 = 4 + 3i$