

Sultan Qaboos University–College of Science
Department of Mathematics and Statistics

MATH1106: Precalculus – Fall 2008 – Test 1

- The duration of this exam is 70 minutes. Set out your work properly. Be clear, neat and concise
- If needed, rough work may be done on the sheet provided. Rough work will not be graded.
- Do not give more than one answer to a question.

Instructions for Multiple Choice Questions:

- Circle the appropriate answer in the Multiple Choice Questions, below.
- Each Multiple Choice Question is worth 3 marks.

1. Simplify: $\frac{\frac{1}{5} + \frac{1}{3}}{\frac{1}{15} + \frac{1}{35}}$
(A) 2 (B) 4 (C) 6 (D) 8
2. Rationalize the denominator: $\frac{10}{3 + \sqrt{7}}$.
(A) $30 - 10\sqrt{7}$ (B) $30 + 10\sqrt{7}$ (C) $15 - 5\sqrt{7}$ (D) $15 + 5\sqrt{7}$
3. Simplify: $\left(\frac{10p^4q^3r^9}{15pq^6r^3}\right)^3$
(A) $\frac{8p^{12}r^9}{27q^6}$ (B) $\frac{8p^7r^6}{27q^5}$ (C) $\frac{8p^9r^{18}}{27q^9}$ (D) $\frac{2p^{12}r^9}{3q^6}$
4. The graph of the equation $x^2y^2 + xy^3 = 1$ is symmetric about the:
(A) x - axis (B) y - axis (C) the origin (D) None
5. Solve the inequality $x^2 + 2x + 3 < 0$.
(A) $(-3, -1)$ (B) \emptyset (C) $(-\infty, 1) \cup (3, \infty)$ (D) $(-\infty, \infty)$

Instructions for Short Answer Questions:

- To get full marks you have to show all necessary work.
- Write your answer in the space provided after the question.
- Simplify your answer when possible.

1. (6 marks) Find all real solutions of the equation $\frac{10}{x-1} - \frac{12}{x-4} + 4 = 0$.
2. (6 marks) Find the domain of the function $g(t) = \frac{\sqrt{1 - |t-1|}}{t-1}$.
3. (6 marks) Hamad and Sultan can do a job together in 40 minutes. If Hamad works twice as fast as Sultan, how long does it take Hamad to do the job alone and how long does it take Sultan to do the job alone?
4. (7 marks) Solve the inequality $\frac{2x-1}{x-1} \leq 3$ and express the solution in interval form.
5. (10 marks) The graph of a function $y = f(x)$ is given below and let $g(x) = 2 - \frac{1}{2}f(x-1)$.
 - (a) Find the domain and range of f .
 - (b) Explain in words how the graph of g is obtained from the graph of f .
 - (c) Determine where the 5 indicated points on the graph of f will go under the transformation $g(x) = 2 - \frac{1}{2}f(x-1)$ and then sketch the graph of $y = g(x)$ on the same coordinate system provided below.

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MATH1106: Precalculus – Fall 2008 – Test 2

- The duration of this exam is 70 minutes. Set out your work properly. Be clear, neat and concise
- If needed, rough work may be done on the sheet provided. Rough work will not be graded.
- Do not give more than one answer to a question.

Instructions for Multiple Choice Questions:

- Circle the appropriate answer in the Multiple Choice Questions, below.
- Each Multiple Choice Question is worth 3 marks.

1. Write the complex number $\frac{(2-i)^2}{i^{25}}$ in the form $a + bi$:
(A) $\frac{3-4i}{i}$ (B) $3-4i$ (C) $-4-3i$ (D) $4+3i$
2. Suppose that $4, \sqrt{2}, 3-2i$ are zeros of a polynomial of degree 4 with real coefficients. Then the other zero is:
(A) -4 (B) $-\sqrt{2}$ (C) $-3-2i$ (D) $3+2i$
3. The exact value of $\log_4(2) + 3\log_4(8)$ is:
(A) 10 (B) 5 (C) 2 (D) 4
4. The solution of the equation $2^{-x} + 3 = 0$ is:
(A) $\log_2(3)$ (B) 0 (C) $-\log_2(3)$ (D) Does not exist
5. If $\sin t = \frac{3}{5}$ and $\cos t < 0$ then $\tan t$ is:
(A) $-\frac{3}{4}$ (B) $-\frac{3}{5}$ (C) -1 (D) $-\frac{4}{3}$

Instructions for Short Answer Questions:

- To get full marks you have to show all necessary work.
- Write your answer in the space provided after the question.
- Simplify your answer as far as possible.

1. (5 marks) Find the exact solution(s) of the equation $4^x - 2^{x+1} = 3$.
 2. (7 marks) Solve the inequality $\log(x-2) + \log(9-x) < 1$. Write your answer in interval form.
 3. (4 marks) Factor the polynomial $P(x) = x^3 - 7x + 6$ completely.
 4. (7 marks) Sketch the graph of the function $f(x) = \frac{x+3}{x^2-4}$. Show clearly all y - and x -intercepts and all asymptotes.
 5. (6 marks) The population of China was estimated to be 1.33 billion in 2008. The relative growth rate is estimated to be 0.629% per year. In which year will the population reach 2 billion?
 6. (6 marks) Find the amplitude, period and phase shift of $y = 2 \cos\left(\frac{\pi}{2}x + \pi\right)$ and sketch its graph.
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MATH1106: Precalculus – Fall 2008 – Final Exam

- The duration of this exam is $2\frac{1}{2}$ hours. Total marks is 100.
- Set out your work properly. Be clear, neat and concise.
- The examination has two parts.
- Part I has 10 multiple choice questions and part II has 12 short answer questions.
- Do all questions and do not give more than one answer to a question.
- If needed, rough work may be done on the sheet provided. Rough work will not be graded.

Part I: Multiple Choice Questions

- This part has 10 questions, 2 marks each for a total of 20 marks.
- Write the most appropriate answer in capital letter in the table below.

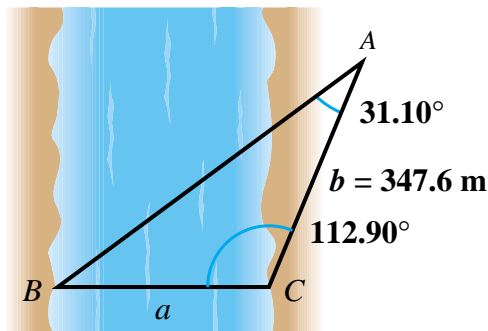
Question	1	2	3	4	5	6	7	8	9	10
Answer										

1. Simplify: $\left(\frac{8}{y} - \frac{y}{8}\right) \div (y + 8)$
 (A) $\frac{8-y}{8y}$ (B) $\frac{1}{8+y}$ (C) -1 (D) $\frac{y-8}{y}$
2. Rationalize the denominator: $\frac{5}{2 + \sqrt{5}}$
 (A) $-10 - 5\sqrt{5}$ (B) $-10 + 5\sqrt{5}$ (C) $10 - 5\sqrt{5}$ (D) $10 + 5\sqrt{5}$
3. The center of the circle $x^2 - 2x + y^2 + 8y - 8 = 0$ is:
 (A) $(1, -4)$ (B) $(-1, 4)$ (C) $(2, -8)$ (D) $(-2, 8)$
4. The imaginary part of $(-2 + 4i)(1 + i)^2$ is:
 (A) $-4i$ (B) -4 (C) 4 (D) $4i$
5. The largest solution set of the inequality $|x - 2| + 3 > 2$ is:
 (A) $(-\infty, 0) \cup (3, \infty)$ (B) \emptyset (C) $(0, 3)$ (D) $(-\infty, \infty)$
6. The solution of the equation $3^{1-x} - 9 = 0$ is:
 (A) 2 (B) 1 (C) -1 (D) Does not exist
7. The solution of the equation $\log_2(\log_3 x) = -1$ is:
 (A) 9 (B) 1 (C) 3 (D) $\sqrt{3}$
8. If $\sin(\theta) = \frac{1}{4}$ and $\frac{\pi}{2} < \theta < \pi$, then $\tan(2\theta)$ is:
 (A) $-\sqrt{15}$ (B) $\frac{\sqrt{15}}{15}$ (C) $-\frac{\sqrt{15}}{7}$ (D) $\frac{\sqrt{15}}{7}$
9. The exact value of $\sin^{-1}\left(\sin \frac{3\pi}{4}\right)$ is:
 (A) $-\frac{3\pi}{4}$ (B) $-\frac{\pi}{4}$ (C) $\frac{3\pi}{4}$ (D) $\frac{\pi}{4}$
10. Simplify $\cos(\sin^{-1} x)$:
 (A) x (B) $\frac{\pi}{2} - x$ (C) $\sqrt{1-x^2}$ (D) $\frac{1}{\sqrt{1-x^2}}$

Part II: Short Answer Questions

- This part has 12 questions for a total of 80 marks.
- To get full marks you have to show all necessary work.
- Write your answer in the space provided after the question.
- Simplify your answer as far as possible.

1. (8 marks) Find the amplitude, period and phase shift of the function $g(x) = 2 - 2 \sin\left(\frac{x}{2} + \pi\right)$, then sketch the graph of g in the interval $[-3\pi, 3\pi]$.
2. (6 marks) Sketch the graph of $f(x) = (x - 1)^2(3 - x)$ clearly indicating all y - and x -intercepts and the end behavior.
3. (7 marks) Sketch the graph of the function $r(x) = \frac{2x^2 - 2}{x^2 + 1}$. Show clearly all y - and x -intercepts and end behavior near asymptotes.
4. (7 marks) Saif cycles 10 km/h faster than he runs. Every morning he cycles 6 km and runs 3 km, for a total of one hour of exercise. How fast does Saif run?
5. (8 marks) Let $f(x) = \sqrt{3 - x}$ and $g(x) = \log_2(2 - x)$. Find $(f \circ g)$, and its domain in interval form.
6. (5 marks) Factor $P(x) = x^4 + x^3 - 6x^2 - 4x + 8$ completely.
7. (4 marks) To measure the distance a across a river, the distance AC is measured to be 347.6 meters. Angles A and C are measured to be 31.10° and 112.90° , respectively. Find the distance a across the



river. (See figure)

8. Find exact solution(s) of:
(a) (4 marks) $\log_x(8) = 2$ (b) (6 marks) $e^x + 5\sqrt{e^x} = 24$
9. (6 marks) Solve the inequality $\frac{x + 1}{x + 3} \leq \frac{3}{(x + 3)(x - 1)}$ and write your answer in interval form.
10. (8 marks) Write $\cos(\cos^{-1} x + 2 \sin^{-1} x)$ as an algebraic expression in x . Simplify your answer.
11. (4 marks) Verify the identity: $\frac{\cot x - \tan x}{\cot x + \tan x} = \cos 2x$
12. (7 marks) Find exact solutions of $2 \sin^2(x) = \sin(2x)$ for $x \in [0, 2\pi)$.