SULTAN QABOOS UNIVERSITY - COLLEGE OF SCIENCE

DEPARTMENT OF MATHEMATICS AND STATISTICS

Interm Examination 1 Fall 2006 09/10/2006

Math 1106 - Precalculus

Instructions: The duration of this exam is 1 hour — The total marks for this exam is 40 — *Do all problems* — To get full marks you have to show all necessary work.

Marks— Q1: 4, Q2: 6, Q3: 6, Q4: 4 + 4, Q5: 6, Q6: 5, Q7: 5

---

1. Simplify and eliminate any negative exponents: $\dfrac{(2x^2y)^{-1}}{(-3x^{-2}y^3)^3}$

2. Simplify: $\dfrac{t-2}{2t^2-5t+3} - \dfrac{3}{t^2-1}$

3. Solve the equation: $x + \sqrt{2x+5} = 5$

4. Solve the following inequalities and express the solutions in interval form:

   (a) $\dfrac{1}{4}(2x-1) - x < \dfrac{x}{6} - \dfrac{1}{3}$

   (b) $|2-3y| \geq 7$

5. Find the domain of $f(x) = \dfrac{3}{x} + \sqrt{\dfrac{1-x}{x+2}}$, and write your answer in interval form.

6. Starting from the graph of $f(x) = \sqrt{x}$, use suitable transformations to sketch the graph of

   $$g(x) = 3 - \sqrt{x-4}$$

   Find the range of g from your graph, and write it in terms of interval.

7. An investor invests 38000 rials at 6% annual interest rate and x rials at a rate of $8\frac{1}{2}\%$. If he receives a total annual interest of 5000 rials, find x.

SULTAN QABOOS UNIVERSITY - COLLEGE OF SCIENCE

DEPARTMENT OF MATHEMATICS AND STATISTICS

Interm Examination 2 Fall 2006 14/11/2006

Math 1106 - Precalculus

Instructions: The duration of this exam is 1 hour — The total marks for this exam is 40 — *Do all problems* — To get full marks you have to show all necessary work.

Marks— Q1: 8, Q2: 5, Q3: 5, Q4: 9, Q5: 4, Q6: 4, Q7: 5

---

1. Let $f(x) = \dfrac{x}{x+1}$ and $g(x) = \sqrt{2x-1}$.

   (a) Find $f^{-1}(x)$

   (b) Find (f/g), $(f \circ f)$, and their domains.

2. Find a polynomial of degree 3 with integer coefficients that has zeros 1 and $2+i$, and leading coefficient 2.

3. Let $P(x) = 3x^3 - 8x^2 + 3x + 2$

   (a) Show that $x-2$ is a factor of $P(x)$.

   (b) Factor $P(x)$ completely and find all zeros.

4. Given the function $h(x) = \dfrac{x^2 - 2x + 1}{x - 2}$,

   (a) Find the $x-$intercept(s) and $y-$intercept, if any.

   (b) Find all asymptotes, if any.

   (c) Sketch the graph of $y = h(x)$.

5. Solve for u: $\log_2 u + \log_2(u+2) = 3$

6. Simplify *without using a calculator*: $\dfrac{\log_3 x + \log_9 x}{\log_{27} x - \log_{81} x}$

7. A culture of bacteria contains 2000 bacteria initially. After 20 minutes, the bacteria count is 6000.

   (a) Find a function of the form $n(t) = n_0 e^{rt}$ that models the number of bacteria after t minutes.

   (b) After how many minutes will the culture contain 4200 bacteria?

SULTAN QABOOS UNIVERSITY - COLLEGE OF SCIENCE

DEPARTMENT OF MATHEMATICS AND STATISTICS

Final Examination Fall 2006 23/12/2006

MATH 1106 - Precalculus

Instructions:

- The duration of this exam is $2\frac{1}{2}$ hours.
- There are 14 questions in this exam. *Answer all questions.*
- To get full marks you have to show all necessary work.

Marks – Q1: 5 + 5, Q2: 2 + 6, Q3: 4 + 4, Q4: 10, Q5: 5, Q6: 4, Q7: 4 + 4, Q8: 3 +
Q9: 5, Q10: 6, Q11: 5 + 6, Q12: 6, Q13: 5, Q14: 2 + 6. **Total Marks: 100**

---

1. Solve the following equations:

   (a) $\dfrac{3x}{x+\frac{1}{2}} = \dfrac{2x-1}{x+2}$

   (b) $u^{1/2} - 8u^{1/4} - 9 = 0$

2. Solve the following inequalities. Write the solution in **interval** notation.

   (a) $|3-x|+2 \geq 0$

   (b) $\dfrac{x+1}{2x-3} \leq \dfrac{1}{3}$

3. Let $g(x) = 2\left[(x-1)^2 - 1\right]$.

   (a) Sketch the graph of g, and write its range.

   (b) Find the inverse of g, for $x \leq 1$.

4. Find all intercepts and asymptotes, if any, and then sketch the graph of t function

$$h(x) = \frac{x^2+x-2}{x^2+3x}$$

5. Solve for z, and express the solutions in the form $a+ib$:

$$(1+i)z^2 - 2iz + 1 - i = 0$$

6. Find the domain of $f(u) = \dfrac{\ln u}{1+\ln u}$.

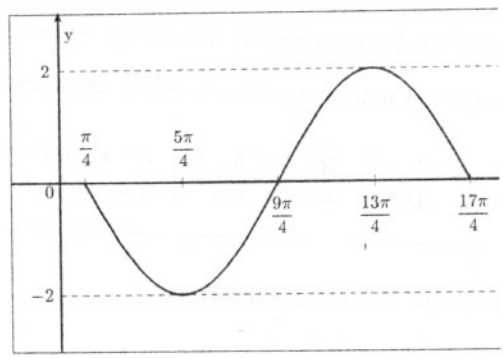
Please Turn Over for the Remaining Question

7. A sum of 5000 Rials is invested at an interest rate of 9% per year, compounded quarterly.

   (a) Find the amount after 5 years.

   (b) Find the time required for the investment to grow to 8000 Rials.

8. The graph of one complete period of a sine curve is shown in the figure.



   (a) Find the amplitude, period and phase shift.

   (b) Write an equation that represents the curve, in the form

$$y = a \sin k(x - b)$$

9. From the top of a light house 200 meters tall, the angles of depression of two ships approaching it from the **same** direction are 30° and 45°. Find the distance between the ships.

10. Solve the triangle ABC for which $a = 6$, $b = 4$, and $\angle A = 110°$.

11. (a) Write $\sin\left(\tan^{-1} x - \sin^{-1} x\right)$ as an algebraic expression in x.

    (b) Prove: $\tan^2\left(\frac{x}{2} + \frac{\pi}{4}\right) = \frac{1 + \sin x}{1 - \sin x}$

12. Solve for x in the interval $[0, 2\pi)$: $\sin x - \cos x + 1 = 0$

13. Express the complex number $-4\sqrt{3} + 4i$ in trigonometric form.

14. Let $z = 8\left(\cos\frac{\pi}{4} + i \sin\frac{\pi}{4}\right)$.

    (a) Find z^3, and write it in the form $a + ib$.

    (b) Find the cube roots of z in **trigonometric form**, and graph the roots in the complex plane.