

**QUEENS COLLEGE
DEPARTMENT OF MATHEMATICS**

**Final Examination
2 ½ Hours**

Mathematics 122

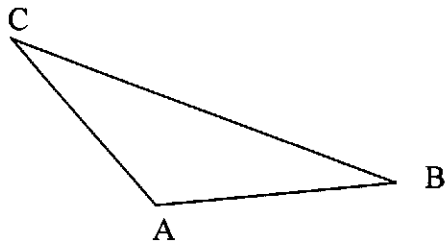
Spring 2008

Instructions: Answer all questions. Show all work.

- 1) Given $f(x) = \sqrt{x+4}$, $g(x) = \frac{1}{x-3}$.
- Sketch the graph of f and determine its domain.
 - Use the graph of f to sketch the graph of f^{-1} .
 - Find an equation for $f^{-1}(x)$.
 - Sketch the graph of " g " and determine its domain.
 - Find each of the following and simplify
 - $(f \circ g)(4)$
 - $(g \circ f)(12)$
- 2) Let A (1, 7) and B (3, 3) be two points in the plane.
- Find the midpoint of the line segment AB.
 - Find the distance between A and B.
 - Find an equation of the line that passes through A and B.
 - Find an equation of the circle centered at A that passes through B.
- 3)
 - Construct Pascal's triangle for the binomial coefficients up to $n=4$.
 - Expand and simplify $(2x - \sqrt{y})^4$.
- 4) Sketch the graph of each of the following equations. Where appropriate, indicate center, vertices, x-intercepts, y-intercepts and vertical and horizontal asymptotes.
- | | |
|--|---|
| <p>a) $y = -\frac{3}{x+2}$</p> <p>b) $y = e^{-x} + 1$</p> <p>c) $y = 6\sin\left(\frac{1}{4}x\right)$, $0 \leq x \leq 2\pi$</p> | <p>d) $y = (x+2)^3 - 8$.</p> <p>e) $y = 2x^2 + 8x - 3$.</p> |
|--|---|
- 5) Evaluate without the use of a calculator:
- | | |
|---|---|
| <p>a) $10^{\log 77}$</p> <p>b) $\sin(\tan^{-1} \sqrt{3})$</p> | <p>c) $\log_2\left(\frac{1}{8}\right)$</p> <p>d) $\log_4 2 + \log_4 32$</p> |
|---|---|
- 6) Let $p(x) = x^4 + 6x^3 + 7x^2 - 6x - 8$.
- Determine which of the following are factors of p :
 - $x-2$
 - $x+1$
 - $x-1$
 - Find all the zeros of p .

(over)

7) In triangle ABC, find $\angle C$, correct to 2 decimal places.



8) Solve for x:

a) $\sqrt{3} \frac{\sin 2x}{\cos 2x} = 1$

b) $2^{3x-5} = 7$

c) $\log_8(x+5) - \log_8(x-2) = 1$

9. Verify each of the following trigonometric identities:

a) $\sin^2 x \cot^2 x + \cos^2 x \tan^2 x = 1$

b) $\frac{1}{\sec x + \tan x} + \frac{1}{\sec x - \tan x} = 2 \sec x$

10. If $\sec A = \frac{3}{2}$, where A is in quadrant IV, and

$\sin B = \frac{1}{3}$, where B is in quadrant II, find

a) $\sin(A-B)$

c) $\cot B$

b) $\cos 2A$

d) $\tan\left(\frac{A}{2}\right)$

11. A rectangle has an area of $16m^2$. Find a function that expresses its perimeter, P, in terms of x, the length of one of its sides.