

**QUEENS COLLEGE
MATHEMATICS DEPARTMENT**

**FINAL EXAM
2 ½ HOURS**

Math 122

Fall 2016

INSTRUCTIONS:

ANSWER ALL QUESTIONS

SHOW ALL WORK

- 1) Let $f(x) = \frac{12}{x-8}$ and $g(x) = \sqrt{x+9}$.
- Find the domain of f and the domain of g .
 - Sketch the graph of $y = g(x)$ by performing a transformation of $y = \sqrt{x}$. Label the x - and y -intercepts and determine the range of g .
 - Use the graph of $y = g(x)$ to sketch the graph of $y = g^{-1}(x)$ on the same set of axes. Label both graphs.
 - Find $g^{-1}(x)$ algebraically and find its domain.
 - Find $(f \circ g)(x)$ and its domain.
 - Find $\frac{f(x)-f(4)}{x-4}$ and simplify.
- 2) Given the points A(-3, 8) and B(7,2):
- Find an equation of the perpendicular bisector of AB.
 - Find an equation of the circle that has points A and B as endpoints of a diameter.
- 3) Sketch the graph of each of the following equations by starting with a known graph and performing transformations. Write equations of the horizontal and/or vertical asymptotes, where appropriate.
- $y = 3^{(x+4)} - 9$
 - $y = \log_2(x-8) + 1$
 - $y = -(x-5)^3$
 - $y = -|x+15| - 20$
 - $y = 6 + \frac{12}{x-1}$
- 4) Let $f(x) = -4x^2 + 24x - 45$
- Express $f(x)$ in standard form.
 - Sketch the graph of $y = f(x)$ by starting with the graph of $y = x^2$ and performing transformations. Label the vertex.
 - State the maximum or minimum value of $f(x)$.

(continued on next page)

5) Sketch the graph of $y = -3 \sin 2x$ on the interval $[0, 2\pi]$ by starting with the graph of $y = \sin x$ and performing transformations.

6) Verify the identity: $\frac{1}{1-\sin x} - \frac{1}{1+\sin x} = 2 \tan x \sec x$

7) a) Solve for x : $e^{3x} = 80$. Round your answer to three decimal places.

b) Solve for x without using a calculator.

i) $\log_{27} 81 = x$

ii) $\log_2 (x+5) + \log_2 (x+3) = 3$

8) Find the exact value without using a calculator.

a) $\sin^{-1}\left(\cos \frac{2\pi}{3}\right)$

b) $\cos 80^\circ \cos 50^\circ + \sin 80^\circ \sin 50^\circ$

c) $\tan \frac{17\pi}{3}$

9) If $\sin A = \frac{3}{5}$, where angle A is in the second quadrant and $\cos B = -\frac{1}{4}$, where angle B is in the third quadrant, find

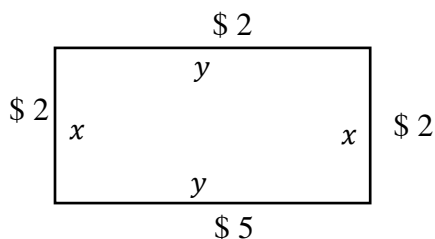
a) $\sin(A+B)$

b) $\sin 2A$

c) $\cos \frac{1}{2}B$

d) $\tan 2B$

10) A farmer wants to enclose a 2400 square foot rectangular field with fencing. If the fencing for three sides of the field cost \$2 a foot and the fencing for the remaining side costs \$5 a foot, express the total cost, C , of enclosing the field in terms of one of the sides, x . (See diagram.)



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