

**Department of Mathematics
Brooklyn College**

**Final Examination – Fall 2011
Math 1011**

Answer all questions. Show all work for full credit.

1) Find the equation of the line that is perpendicular to $y = 4x + 3$ and passes through $(-3, 4)$.

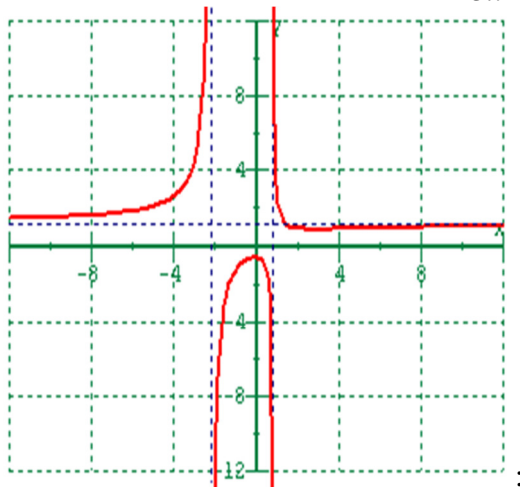
2) Solve the following equations and inequalities:

- a) $|3x + 4| \leq 10$
- b) $x^4 + 10x^2 + 16 = 0$
- c) $\sqrt{2x + 13} = x + 5$
- d) $e^{2x} = 50$
- e) $\log_{10}(x - 2) + \log_{10}(x + 5) = 1$

3) For the function $f(x) = 3x + 5$ and $g(x) = x^2 - 2$

- a) Find $\frac{f(x+h) - f(x)}{h}$
- b) Find the inverse of $f(x)$
- c) Find $(f \circ g)(x)$

4) The graph of the function $f(x) = \frac{6x^2 - 3x + 5}{5x^2 + 7x - 9}$ is shown below



- a) What is the domain?
- b) What is the range?
- c) Over what intervals is the function increasing?
- d) Over what intervals is the function decreasing?
- e) For what intervals is $f(x) > 0$?

5) Use transformations to sketch the following graphs. Mark on the graph and state clearly the horizontal and vertical asymptotes and x -intercept(s) and y -intercept(s), if they exist.

a) $f(x) = \sqrt{x-4}$

b) $f(x) = \frac{1}{x+2} - 6$

c) $y = 2^{-x}$

d) $y = -\log_{10} x$

6) Find and state the horizontal and vertical asymptotes and x -intercept(s) and y -intercept(s), if they exist. Use these to draw the following graphs.

a) $y = x^4 - 16x^2$

b) $y = \frac{2x+3}{x-4}$

7) Use the rational root test to solve the equation $f(x) = x^3 - 9x^2 + 20x - 12$

8) Use the given information to find the value of $\sin \theta$, $\cos \theta$, and $\tan \theta$:

a) The point $(-3, -4)$ is on the terminal side of θ

b) θ lies in the fourth quadrant and $\cos \theta = \frac{2}{5}$

9) Sketch the graph of $y = 3\sin(2x - \pi)$. State the fundamental interval amplitude, period, and phase shift.

10) Verify the identity $\cot(x - \csc x)(\cos x + 1) = -\sin x$.

11) Use the sum formula to find the exact value of $\tan 75^\circ$.

12) Given that $\tan x = \frac{3}{4}$ and $\sin x < 0$ find the value of the following:

a) $\cos 2x$

b) $\sin \frac{x}{2}$

13) Find $\tan^{-1}\left(\frac{-1}{\sqrt{3}}\right)$.

14) Find all solutions to the equation $2\sin^2 \theta = 8$.

15) Sketch the graph of $\frac{(x-5)^2}{36} + \frac{(y+2)^2}{9} = 1$. Find its center, vertices, and foci.

16) Sketch the graph of $9x^2 - 25y^2 = 400$. Find its vertices, asymptotes, and foci.

17) Find the coefficient of the term x^4 in the expansion of $(x+2)^7$