NAME: Solution

MAC 1147 Section 3089
Quiz Five

Please show all of your work in a NEAT and ORGANIZED fashion.

1. (3 points) Perform the subtraction and write the result in standard form:

$$\frac{5i}{1+2i} - \frac{7i}{1-2i} =$$

$$\frac{5i(1-2i) - 7i(1+2i)}{1-4i^2} =$$

$$\frac{5i - 10i^2 - 7i - 14i^2}{1+4} = \frac{-2i+24}{5} = \frac{24}{5} - \frac{2}{5}i$$

2. (3 points) Write the polynomial $f(x) = x^4 + 2x^3 + 11x^2 + 18x + 18$ as a product of linear factors. (*Hint:* One factor is $x^2 + 9$.)

$$\begin{array}{r} x^2+2x+2 \\ x^2+9 \overline{)\, x^4+2x^3+11x^2+18x+18} \\ \underline{x^4+0x^3+9x^2} \\ 2x^3+2x^2+18x \\ \underline{2x^3+0x^2+18x} \\ 2x^2+18 \\ \underline{2x^2+18} \\ 0 \end{array}$$

$$\frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{-2 \pm \sqrt{4-4(2)}}{2} = \frac{-2 \pm \sqrt{-4}}{2} = -1 \pm i$$

So $f(x) = (x^2+9)(x^2+2x+2)$
$= (x+3i)(x-3i)(x+1+i)(x+1-i)$.

3. (3 points) For the following function, (a) identify all intercepts, and (b) find any vertical or horizontal asymptotes:

$$g(x) = \frac{x^2-2x-8}{x^2-9} = \frac{(x-4)(x+2)}{(x+3)(x-3)} = \frac{N(x)}{D(x)}$$

a) x-intercepts: $(4,0)$, $(-2,0)$

y-intercept: $g(0) = \frac{-4(2)}{-9} = \frac{8}{9} \longrightarrow (0, \frac{8}{9})$

b) vertical asymptotes (when $D(x)=0$): $x=-3$, $x=3$

horizontal asymptote: $y = \frac{1}{1} = 1$