

NAME: Solution

MAC 1147 Section 3077

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

1. (3 points) Write the quotient in standard form:

$$\begin{aligned}\frac{8i}{(3-i)^2} &= \frac{8i}{9-6i+i^2} \\ &= \frac{8i}{8-6i} \\ &= \frac{4i}{4-3i} \cdot \frac{(4+3i)}{(4+3i)} \\ &= \frac{16i+12i^2}{16+9} = -\frac{12}{25} + \frac{16}{25}i\end{aligned}$$

2. (3 points) Write the polynomial $f(x) = 2x^4 - x^3 + 49x^2 - 25x - 25$ as a product of linear factors. (Hint: One factor is $x^2 + 25$.)

$$\begin{array}{r} 2x^2 - x - 1 \\ x^2 + 25 \overline{) 2x^4 - x^3 + 49x^2 - 25x - 25} \\ \underline{2x^4 + 0x^3 + 50x^2} \\ -x^3 - x^2 - 25x \\ \underline{-x^3 + 0x^2 - 25x} \\ -x^2 \\ \underline{-x^2 } \\ 0 \end{array}$$

$$\begin{aligned}f(x) &= (x^2 + 25)(2x^2 - x - 1) \\ &= (x + 5i)(x - 5i)(2x^2 - x - 1) \\ &= (x + 5i)(x - 5i)(2x + 1)(x - 1)\end{aligned}$$

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

$$\begin{aligned}f(x) &= \frac{6x^2 - 11x + 3}{6x^2 - 7x - 3} = \frac{(3x-1)(2x-3)}{(3x+1)(2x-3)} \\ &= \frac{3x-1}{3x+1}, \quad x \neq \frac{3}{2} \\ &= \frac{N(x)}{D(x)}\end{aligned}$$

a) x-intercept: $(\frac{1}{3}, 0)$

y-intercept: $f(0) = \frac{-1}{1} = -1 \rightarrow (0, -1)$

b) vertical asymptote (when $D(x) = 0$): $x = -\frac{1}{3}$

horizontal asymptote: $y = \frac{3}{3} = 1$