MAC 1140 Quiz 10: March 23, 2017

Name: [Student’s Name]  
Score: [Score]

Show all work. Answers given with incomplete reasoning will not receive full credit.

Question 1 (2 points) Perform the division
\[
\frac{2 - i}{3 + 2i}
\]
and write your answer in standard form.

\[
\frac{2- i}{3 + 2i} = \frac{2- i}{3 + 2i} \cdot \frac{3-2i}{3-2i} = \frac{6-4i-3i+2i^2}{9-4i^2} = \frac{6-7i-2}{9+4} = \frac{4-7i}{13} = \frac{4}{13} - \frac{7}{13}i
\]

Question 2 (2 points) Calculate \(i^{357}\).

Note that \(4 \sqrt[89]{357} \equiv 0 \pmod{357} = 4.89 + 1\)

Thus, \(i^{357} = i^{4.89+1} = i^{4.89} \cdot i = (i^{89})^{0.89} \cdot i = (-1)^{0.89} \cdot i = \bar{i} \cdot i = i \)

\(= (i^4)^{89} \cdot i = (1)^{89} \cdot i = 1 \cdot i = i\)
Question 3 (3 points) Let

\[ f(x) = \frac{(x - 1)(x + 3)(x - 2)}{(x - 1)^2(x - 3)(x + 2)} \]

Find all vertical asymptotes of \( f(x) \) and all zeros of \( f(x) \).

Note \( f(x) = \frac{(x-1)(x+3)}{(x-1)(x-3)(x+2)} \)

\[ = \frac{(x+3)(x-2)}{(x-1)(x-3)(x+2)} \]

So, the VAs are \( x = 1 \)
\[ x = 3 \]
\[ x = -2 \]

Setting \( f(x) = 0 \) gives \( (x+3)(x-2) = 0 \)
\( \Rightarrow \) \( x = -3, 2 \). Since -3 and 2 are in the domain of \( f(x) \), the zeros are \( x = -3, 2 \).