EXAM 3 - MATH 111 Friday, March 29

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Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. (a) Perform the long division $(x^4 - x^3 - 5x^2 - 3) \div (x^2 + 4)$ and write your answer in the appropriate form.

(b) Let $f(x) = 3x^3 - 5x^2 - 107x - 35$. Given that $f(7) = 0$, use the factor theorem to factor $f(x)$ completely and find all its remaining roots.

2. Consider the rational function $f(x) = \dfrac{(x+2)(x-5)}{(x+5)(x-1)^2}$.

(a) Find the domain.

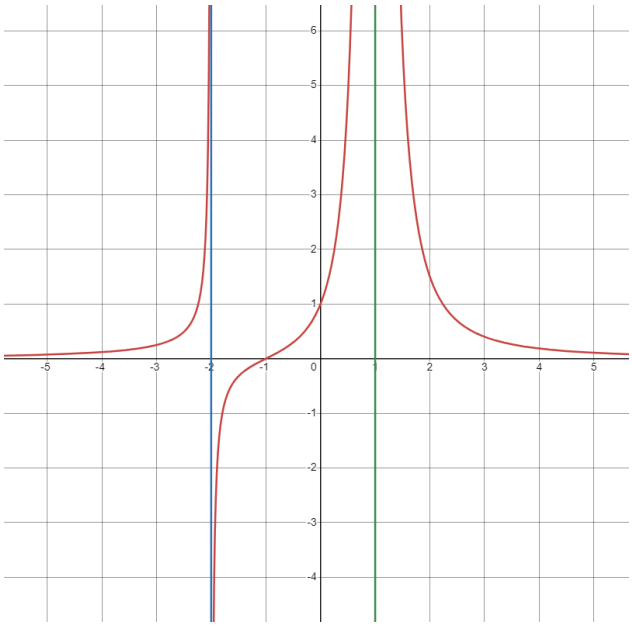
(b) Find the vertical asymptotes.

(c) Find the horizontal asymptote (all steps).

(d) Find the y- and the x-intercepts (all steps).

(e) Sketch the graph by hand, showing all important features.

3. Consider the graph of a rational function $y = f(x)$ shown below.



(a) Find the domain.

(b) Find the vertical asymptotes.

(c) Find the horizontal asymptote.

(d) Find the y- and the x-intercepts.

(e) Find a formula for $y = f(x)$ with all explanations.

4. A quantity x varies directly with the cube root of y and inversely with the square of z. Suppose we know that, when $y = 64$ and $z = 2$, then $x = 5$. Find the value of y, when $x = 5$ and $z = 2$ (Show all steps).

5. In a park, the initial population of a certain species consisted of 136 individuals. Three years later the population had fallen to only 17 individuals. Assuming an exponential trend, find (by hand, showing all steps) a model for the population $P(t)$ as a function of time t.