MATH 103 Pre-Calculus Mathematics Name_____
Test #3 Fall 2008 (November 20)

Please answer all questions in the given "Blue Book", except for the one that asks for the sketch of a graph. Show any relevant work used in arriving at (or verifying) an answer, but be sure to clearly mark that answer.

You will be graded on your best seven answers from among the nine problems.

1. Let $P(x) = 3x^4 + 2x^3 - x + 2$ and $D(x) = x^2 + 2x - 1$. Find polynomials $Q(x)$ and $R(x)$ such that $P(x) = Q(x) \cdot D(x) + R(x)$. (That is, divide $D(x)$ into $P(x)$ to find the quotient $Q(x)$ and remainder $R(x)$.)

2. Demonstrate, in as simple a way as possible, that $x-3$ is not a factor of $P(x) = 2x^2 - x + 4$.

3. Let $P(x) = \frac{1}{3}x^3 - \frac{1}{2}x^2 + 4x + \frac{1}{4}$. Use the *Rational Zero Test* to compile a set of rational numbers that are candidates for being zeros of $P(x)$.

4. Determine a polynomial $P(x)$ with zeros at $x = 2$ and $x = -1$ and satisfying $P(3) = 8$.

5. Determine a rational function f having a vertical asymptote at $x = -2$ (and nowhere else), zeros at $x = 4$ and $x = -3$ (and nowhere else), a horizontal asymptote at $y = 0$, and a "hole" at $x = 5$.

6. Factor completely the polynomial $P(x) = x^4 - x^3 - 5x^2 + 3x + 6$.

Hint: One of its zeros is $x = -1$.

7. Express the polynomial $P(x) = x^3 - 5x^2 + 17x - 13$ as a product of three linear factors.

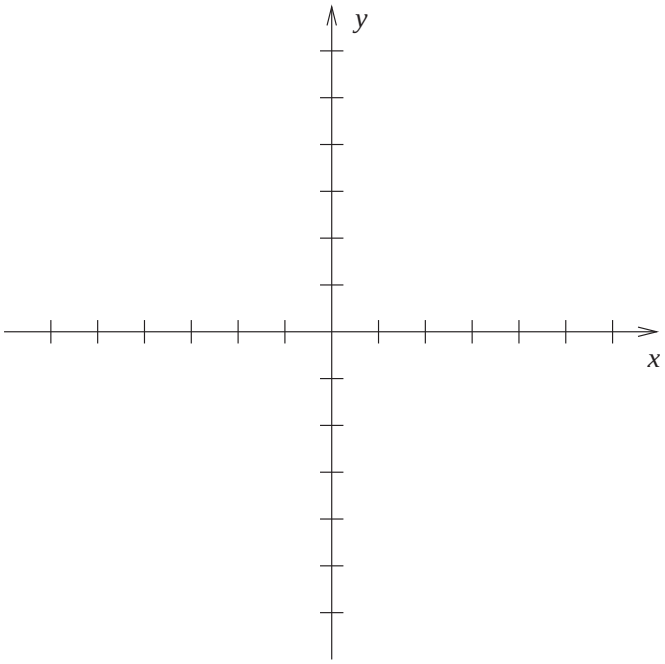
Hint: P has only one real zero.

8. Let

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

Identify the domain and range of f, as well as any horizontal asymptotes, vertical asymptotes, "holes", and zeros.

In the space below, sketch the graph of f (and make sure that it is consistent with the first part of your answer).



9. Match the equation with the graph.
(a) $y = \frac{1}{2}(x-1)^3(x+2)$
(b) $y = -(x-1)^2(x+2)$
(c) $y = (x-1)(x+2)$

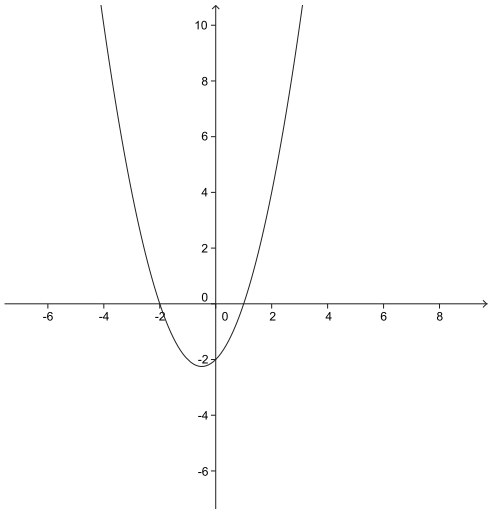


Figure 1:

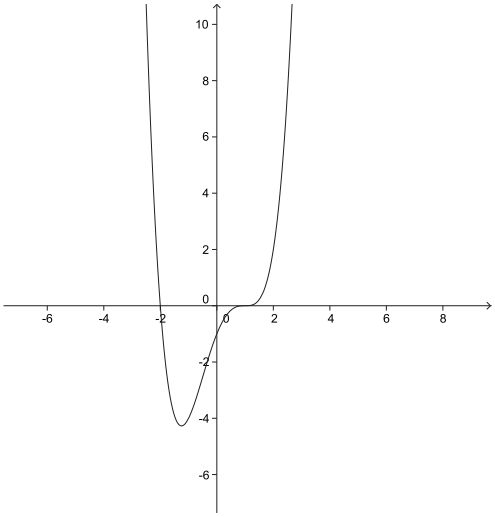


Figure 2:

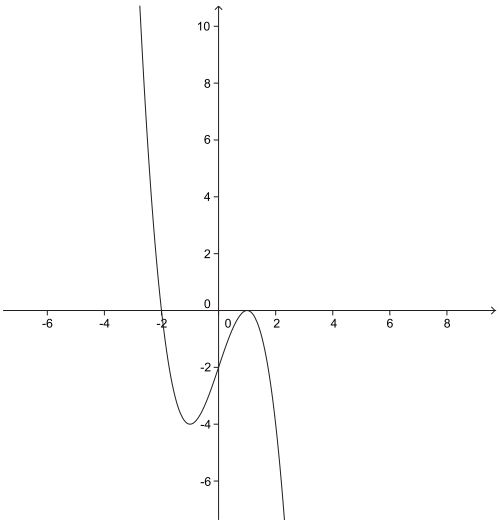


Figure 3: