Sample Exam II

MAT 1375 Spring 2020

NAME:

Part I. Functions.

1. a) $(f \circ g)(x) = \dfrac{1}{x^2} + 1$, domain=$R - \{0\}$, range=$(1, +\infty)$ b) $(f/g)(x) = x^3 + x$, domain=$R - \{0\}$, range=R, c) $(f - g)(x) = \dfrac{x^3 + x - 1}{x}$, domain=$R - \{0\}$, range=R.

2. a) $(f + g)(1) = 0$ b) $(f \circ g)(2) = 0$ c) $(\dfrac{f}{g})(0) = -1$

3. Graph is invertible, reflect in the line $y = x$ to get the graph of its inverse.

4. $f^{-1}(x) = \dfrac{x^2}{2} - 6x + 20$, check if $(f \circ f^{-1})(x) = (f^{-1} \circ f)(x) = x$.

5. Restricted domain can be $(-\infty, 0]$ OR $[0, +\infty)$.

Part II. Polynomials and Rational functions.

1. $\dfrac{x^5 - x^3 + x + 6}{x - 2} = x^4 + 2x^3 + 3x^2 + 6x + 13 + \dfrac{32}{x - 2}$.

2. $f(-2) = (-2)^3 + 2(-2) - 1 = -13$.

3. $f(2) = 2^3 - 2^2 - 4(2) + 4 = 4$, so $(x - 2)$ is NOT a factor of $f(x)$.

4. $f(x) = 2x^3 - 2x^2 - 24x$.

5. $6x^3 - 13x^2 + x + 2 = (x - 2)(2x - 1)(3x + 1)$. Use your calculator to find root at $x = 2$, so $(x - 2)$ is a factor. Then divide $6x^3 - 13x^2 + x + 2$ by $(x - 2)$. Factor the resulting quadratic to get the final answer.

6. $x^2 - 4x + 5$.

7. $x^4 - x^3 + 6x^2 - 4x + 5$.

8. x-intercepts: $(-1.62, 0), (-.62, 0, (0, 0), (.62, 0)$ and $(1.62, 0)$, local max's: $(-1.3, 1.6), (.35, .23)$ and local min's: $(-.35, -.23), (1.3, -1.6)$.

9. (a) domain=$R - \{0\}$, no horizontal asymptote, vertical asymptote at $x = 0$, x-intercepts at $(-2, 0), (-1, 0)$ and no y-intercept.

   (b) domain=$R - \{3, 5\}$, no horizontal asymptote, vertical asymptotes at $x = 5$ and $x = 3$, y-intercept at $(0, 0)$, x-intercepts at $(0, 0), (-2, 0), (2, 0)$.

   (c) domain=$R - \{1, 2\}$, vertical asymptote at $x = 2$, removable discontinuity (hole) at $x = 1$, no horizontal asymptote, y-intercept at $(0, 9/2)$, x-intercepts at $(-3, 0), (-1, 0), (0, 3)$.