MATH 1813: Review, Exam 4 Quizzes, Spring 2020

On all problems, be prepared to show your work or explain your reasoning.

Exam 4 Quiz, Part 1: Sections 10.1 to 10.3

Section 10.1: Compositions

1. If $A(r)$ is the area of a circle with radius r, and $V(A)$ is the volume of a cylinder with a circular base of area A and height 3 feet, then give the meaning of $V(A(r))$.

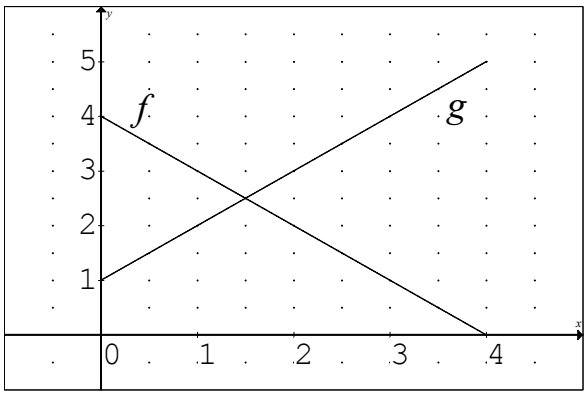
2. Find **two different** possible formulas for each $g(x)$ and $h(x)$, given that $f(x) = g(h(x)) = \dfrac{1}{x^2 + 12x + 36}$. Assume $g(x) \neq x$ and $h(x) \neq x$.

3. Suppose $u(v(x)) = \dfrac{1}{x^2 - 1}$ and $v(u(x)) = \dfrac{1}{(x-1)^2}$. Find possible formulas for $u(x)$ and $v(x)$.

4. Let $p(x) = 2x - 3$ and $q(x) = \sqrt{x} - 3$. Find $u(x)$ so that $q(x) = p(u(x))$.

Section 10.2: Inverses

5. Using the graphs of f and g, solve each equation.



(a) Solve $f(g(x)) = 1$ for x.

(b) Solve $g(f(x)) = 5$ for x.

(c) $f^{-1}(3)$

(d) $g^{-1}(4)$

(e) $g(f^{-1}(1))$

6. Let $r(x) = \dfrac{3x - 4}{2x + 5}$. Find $r^{-1}(x)$.

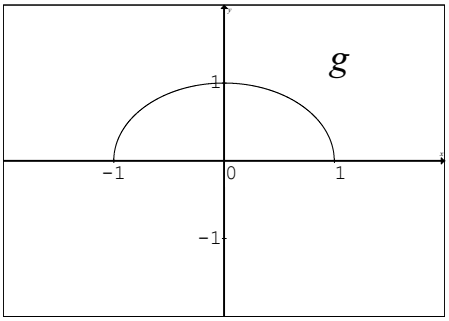
7. The function $H = f(t) = 75 + 110(0.90)^t$ represents the temperature of a cup of coffee, in degrees Fahrenheit, t minutes after it is poured.

(a) Find a formula for $f^{-1}(H)$.

(b) Evaluate $f^{-1}(150)$ and explain its meaning in terms of the cup of coffee. *Round to 1 decimal.*

8. Functions f, g, and h are given below (represented by a table, a graph, and a formula, respectively).

x	-1	0	1
$f(x)$	5	3	2



$h(x) = 4 - 3x^2$

Find each of the following

(a) $h(-1)$ (b) $f(0)$ (c) $g(1)$

(d) $f(g(0))$ (e) Solve $g(x) = 0$. (f) Find $f\left(f^{-1}(5)\right)$.

Section 10.3: Combining of Functions

9. Find formulas for the following functions, given $f(x) = \sin x$ and $g(x) = x^2$.

(a) $f(x) + g(x)$ (b) $g(x)\,f(x)$ (c) $g(f(x))$

10. Give formulas for f, g, and G so that $F(x) = f(G(x)) \cdot g(x)$. *There may be more than one possible answer.*

(a) $F(x) = 6xe^{3x^2}$ (b) $F(x) = -\dfrac{\sin\left(\sqrt{x}\right)}{2\sqrt{x}}$

Section 11.1: Power Functions

11. Is the function a power function? If so, write it in the form $f(x) = kx^p$ and identify the values for k and p.

(a) $g(x) = \dfrac{\sqrt{16x}}{11x^{1/4}}$ (b) $h(x) = (8ex^3)(4x^{-1})$

12. Find a power function $f(x) = kx^p$ through the two points: $(2, -1.6)$ and $(4, -12.8)$.

13. The pressure *P* of an enclosed gas is inversely proportional to the volume *V*. In a spherical balloon with volume 3000 in^3, the pressure is 20 lb/in^2. If the volume of the balloon is increased to 4000 in^3, what is the pressure of the gas? *Round to a whole number.*

14. Find each of the following.

(a) $\lim_{x \to \infty} x^{-2}$ (b) $\lim_{x \to -\infty} (x^{-3} + 1)$

Section 11.2/11.3: Polynomials

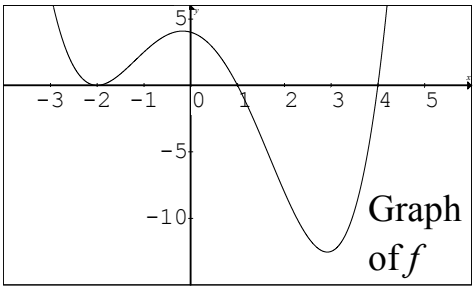
15. Find $\lim_{x \to \infty} (-2x^3 + 7x - 5)$.

16. Find each of the following for the polynomial: $f(x) = 3(1-2x)^5 (x+4)^3$.

(a) Leading term (b) Degree of *f* (c) Zeros

(d) As $x \to -\infty$, $f(x) \to$ _____. (e) As $x \to \infty$, $f(x) \to$ _____.

17. Find a polynomial of degree 4 (as shown) with $f(0) = 4$, $f(-2) = 0$, $f(1) = 0$, and $f(4) = 0$. *You may leave your answer in factored form.*



Graph of *f*

18. Use long division to determine whether $x - 6$ is a factor of $h(x) = x^3 - x^2 - 29x - 6$. If it is a factor, find all the zeros of *h*.

19. Find a polynomial with least possible degree through the points $(-5, 0)$, $(2, 0)$, and $(0, -1)$. *Write your answer in standard form.*

Section 11.4/11.5: Rational Functions

20. Find each of the following for the given rational functions *f* and *g* below.

$$f(x)=\frac{2x^2-4}{x^2-1} \qquad\qquad g(x)=\frac{2x-1}{2x^2+11x-6}$$

(a) Intercepts

(b) Horizontal or vertical asymptotes

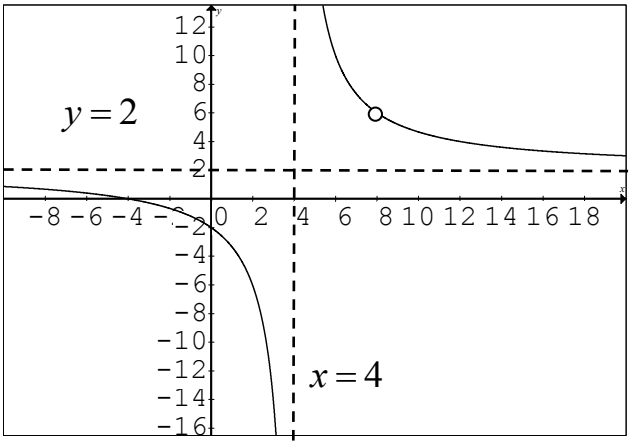
(c) Determine whether there are any holes in the graph. If so, give the coordinates.

(d) Domain, in interval notation

21. Evaluate the limits.

(a) $\lim\limits_{x\to\infty}\left(\dfrac{3x^2-x+1}{2x^2+5}\right)$ (b) $\lim\limits_{x\to-\infty}\left(8x^{-3}+5x^{-1}+1\right)$

22. Find a possible formula for the rational function shown. Note that $f(0)=-2$, $f(-4)=0$, and the hole is at (8, 6).



23. Find a possible formula for the rational function *g* described below:

- *g* has two vertical asymptotes: one at $x = -2$ and one at $x = 3$
- *g* has a horizontal asymptote of $y = 0$
- *g* crosses the *x*-axis once, at $x = 5$
- Passes through the point (4, 0.5)