Comp Review WS #11

1. Give an example of a power function which is not a polynomial. (A power function is of the form $y = ax^b$ where a and b are any real numbers.)

2. Give an example of a polynomial function which is not a power function.

3. What is the domain of any polynomial?

4. Are all polynomials continuous?

5. If $x = a$ is a zero of a polynomial, then what is one of its factors?

6. If the degree of a polynomial is odd, what is the least number of x-intercepts? Give an example.

7. If the degree of a polynomial is even, what is the least number of x-intercepts? Give an example.

8. For any polynomial what is the least and most number of vertical intercepts? Explain.

9. Given an example of a 4th degree polynomial with the conditions below or explain why it can't be done.

   (a) five real zeros
   (b) four real zeros
   (c) three real zeros only
   (d) two real zeros only
   (e) one real zero only
   (f) no real zeros

10. Match column A with all possible answers from column B.

Note: In some cases there may be more than one answer, answers may be used in more than one expression and some answers may not be used.

Column A

_____ i. $\dfrac{x^2+1}{x^2-1}$

_____ ii. x^3+5

_____ iii. $(x-4)^2-10$

_____ iv. x^2+4

_____ v. $\dfrac{1}{x}$

_____ vi. x^3+x+1

_____ vii. $(x-4)(x-6)$

Column B

a. polynomial of degree 2

b. odd function *(graphs are helpful)*

c. even function *(graphs are helpful)*

d. y-intercept is (0,6)

e. even degree polynomial

f. has no x-intercepts

g. has exactly two zeros

h. odd degree polynomial

11. State the domain for each function. Assume A and B are constants.

(a) $T(m) = \dfrac{m^2 - 4}{(m + 2)(m - 3)}$

(b) $f(t) = \dfrac{15t^3 + 5t^2 - 3t + 2}{4t^2 - 12}$

(c) $g(r) = \dfrac{r - 6}{Ar - B}$

(d) $h(y) = \dfrac{y^2 - 5}{y^3 - 5y^2 + 6y}$

12. Write an equation for:

(a) A rational function (not a polynomial) with no vertical asymptotes.

(b) A rational function with asymptotes $y = 0$, $x = 2$, and $x = -3$ only.

(c) A rational function with asymptotes $y = -1/3$, $x = 4$ and $x = -6$ only and zeros at 2 and 7.

(d) A rational function with asymptotes $y = 6/5$, $x = 6$ and $x = -3$ only and only one zero at 1.

13. Use the graphs of $f(x)$ and $g(x)$ given below to answer the following:

$f(x)$

$g(x)$
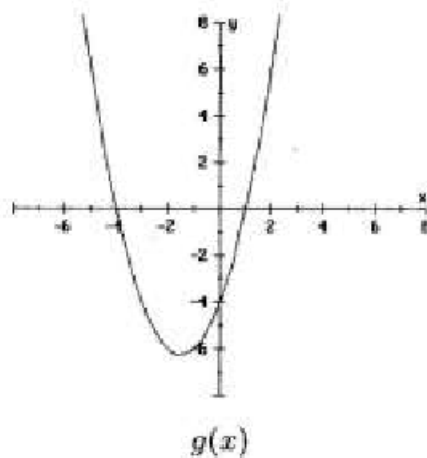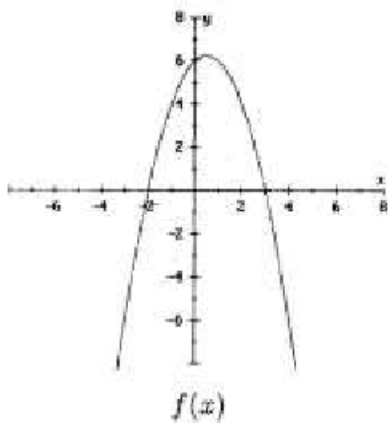
(a) If we let $h(x) = \dfrac{f(x)}{g(x)}$, is $h(x)$ a rational function? Why or why not?

(b) What is (are) the vertical asymptote(s) of $h(x)$?

(c) What is (are) the zero(s) of $h(x)$?

14. Suppose $y = f(x)$ is a rational function with a horizontal asymptote of $y = 3$ and a vertical asymptote of $x = 5$ only.

(a) What is the domain of $f(x)$?

(b) What are the asymptotes of the transformed function $f(x + 1)$?

(c) What are the asymptotes of the transformed function $f(x) + 2$?

(d) What are the asymptotes of the transformed function $-3f(x)$?

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Comp Review WS 11 Answer Key

Note there are many possible answers

1. Any power function with a non-integer power:
   $y = \sqrt{x}$ or $y = x^{1/2}$

2. Any polynomial with more than one term:
   $y = x^2 + x + 1$

3. $\mathbb{R}$

4. Yes

5. $(x - a)$

6. one; $y = x$

7. zero; $y = x^2 + 1$

8. one; must be a function

9. (a) degree n has at most n zeros
   (b) $y = (x - 1)(x - 2)(x - 3)(x - 4)$
   (c) $y = (x - 1)(x - 2)(x - 3)^2$
   (d) $y = (x - 1)^2(x - 2)^2$
   (e) $y = (x - 1)^4$
   (f) $y = x^4 + 1$

10. (i) c, f
    (ii) h
    (iii) a, d, e, g
    (iv) a, c, e, f
    (v) b, f
    (vi) h
    (vii) a, e, g

11. (a) $(-\infty, -2) \cup (-2, 3) \cup (3, \infty)$
    (b) $(-\infty, -\sqrt{3}) \cup (-\sqrt{3}, \sqrt{3}) \cup (\sqrt{3}, \infty)$
    (c) $(-\infty, B/A) \cup (B/A, \infty)$
    (d) $(-\infty, 0) \cup (0, 2) \cup (2, 3) \cup (3, \infty)$

12. (a) $f(x) = \dfrac{1}{x^2 + 1}$
    (b) $f(x) = \dfrac{1}{(x - 2)(x + 3)}$
    (c) $f(x) = \dfrac{-(x - 2)(x - 7)}{3(x - 4)(x + 6)}$
    (d) $f(x) = \dfrac{6(x - 1)^2}{5(x - 6)(x + 3)}$

13. (a) Yes by definition
    (b) $x = -4$ and $x = 1$
    (c) $x = -2$ and $x = 3$

14. (a) $(-\infty, 5) \cup (5, \infty)$
    (b) $x = 4$ and $y = 3$
    (c) $x = 5$ and $y = 5$
    (d) $x = 5$ and $y = -9$