MATH 163

Name:_____

Final Exam Practice

1. Solve the following equations:

a. $\frac{5}{2x-3}=\frac{3}{x+5}$ b. $x^4+7x^2-8=0$ c. $|3x-6|+3=30$

d. $\log(x+2)-3=1$ e. $6^{1-2x}+2=12$ f. $\ln\left(\frac{3}{8}x+1\right)=10$

g. $|1-5x|+4=1$ h. $\sqrt{x-1}+7=x$ i. $\log_5 6^{2x-1}=2$

j. $|x^2-5x|=6$

2. Solve and write your answer in interval notation:

a. $|4x-9|+1\geq 12$ b. $3x^2-7x-20\geq 0$ c. $5-|3x+1|>2$ d. $\frac{x^2+5x}{x^2-9}\leq 0$

3. Given $f(x)=\frac{5x^2-3x+7}{2x^2-8}$; $g(x)=\frac{20x^3-5x^2}{5x^2+1}$; $h(x)=\frac{x-4}{x^2-3x-4}$ determine the:

a. domain b. x-intercept(s) c. vertical asymptote(s)

d. horizontal asymptote e. oblique/slant asymptote f. graph g(x) using a-e.

4. Given $f(x)=\frac{3x}{2x+5}$; $h(x)=x^2-3x-28$; $g(x)=\sqrt{\frac{4}{3}x-1}-9$; $p(x)=6x-3$

a. State the domain of f(x) b. State the domain of g(x) c. Determine f(x + 2)

d. Determine g(3x) e. Determine $(f\circ g)\left(\frac{3}{4}\right)$ f. Determine (g ○ p)(x)

g. Determine $f^{-1}(x)$ h. Determine $g^{-1}(x)$ i. Determine (p - h) (x)

j. Determine (h+ p)(x) k. (hp)(x) l. The domain of $\left(\frac{p}{h}\right)(x)$

5. Show that $f(x) = 2x + 7$ and $g(x) = \frac{x-7}{2}$ are inverses of each other.

6. Given $f(x) = \begin{cases} 2x+1 & x < -4 \\ \frac{4}{3}x - 5 & x \geq -4 \end{cases}$

   a. Evaluate f(9) b. Evaluate f(-7) c. graph f(x).

7. For the polynomials given below, **list each real zero and its multiplicity**. Then draw a graph of the polynomial.

   a. $f(x) = -9x(x-5)(3x+5)^2$ b. $g(x) = 4(x+3)^2(x-2)(x-5)^2$

8. Given polynomial $g(x) = x^4 + 4x^3 + 2x^2 - x + 6$,

   a. What is the maximum # of zeroes g(x) could have?

   b. What is the maximum # of turning points g(x) could have?

   c. list all of the potential rational zeroes of g(x)

   d. Is $(x-3)$ a factor of g(x)? Explain.

   e. Write g(x) in its fully factored form.

   f. Find all zeroes (real and complex) of g(x)

9. Find all of the zeroes (real and complex) of the polynomials below:

   a. $f(x) = 3x^3 - x^2 + 27x - 9$ b. $g(x) = (x+3)(x^2 - 4x - 1)$

10. Form a polynomial with real coefficients of degree 4 that has zeroes: $x = 0$, $x = -1$, $x = -5i$

11. Suppose the function $h(t) = -16t^2 + 50t + 15$ gives the height of an object in feet over time (in seconds).

    a. When does the object reach its highest point?

    b. When does the object hit the ground?

12. Suppose a company finds that the revenue, in dollars, from sales of a particular product is a function of the unit price **p**, in dollars, that it charges. The revenue **R** is given by:

$$R(p) = -\frac{1}{4}p^2 + 1500p$$

    a. What unit price should be set to maximize revenue? b. What is the maximum revenue?

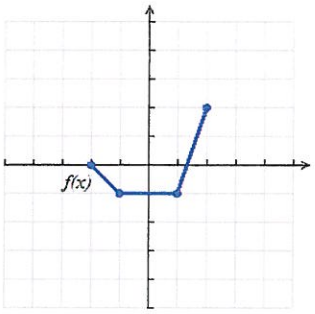
13. Sketch the graph of the following using transformations:

    a. $f(x) = -(x+1)^2 - 2$

    b. $g(x) = \log_2(x-1) + 3$

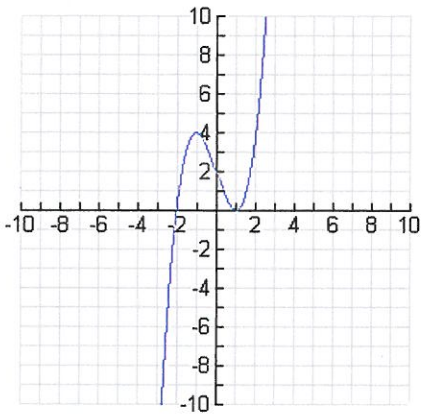
    c. $f(x) = 2\sqrt{x-3}$

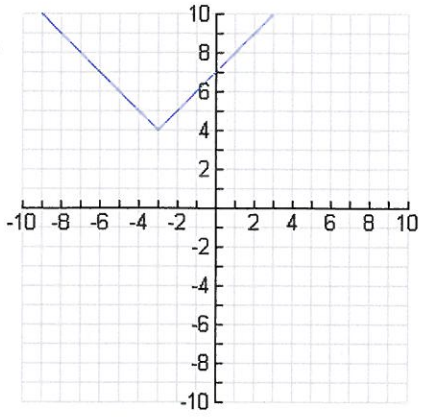
    d. $h(x) = -2^x + 5$

    e. 

    graph $f(-x)+1$

14. Write a function for each graph below that could describe it:

    a. 



15. Identify the transformations involved to get from $f(x) = \sqrt{x}$ to

a. $g(x) = -\sqrt{x-4}$ b. $h(x) = 3\sqrt{x} + 5$

16. Find the zeros $P(x) = x^4 + 3x^3 + 12x - 16$, (given that $-2i$ is a zero).

17. The decay model $A(t) = 34e^{-.00244t}$ describes the amount of Strontium 90 left in a sample that is present after t years, if 34 grams are present to begin with.

a. How much Strontium 90 will be left after 100 years?

b. How long will it take until 20 grams remain?

18. The growth model $P(t) = 300e^{0.03t}$ describes the size P of an insect population after t days, if 300 insects are present to begin with.

a. What is the population after 8 days?

b. When will the insect population triple

19. Evaluate the following: a) $\log 100$ b) $\ln 1$ c) $\log_3\left(\frac{1}{9}\right)$ d) $\log_4 2 + \log_4 4$

20. Use either $A = P(1+\frac{r}{n})^{nt}$ *or* $A = Pe^{rt}$ to answer each of the following:

a) What amount results from a $480 investment at 7% compounded quarterly after 2 years?
b) What amount results from a $12,000 investment at 5.7% compounded continuously after 8 years?
c) How much should be invested to get $2000 after 6 years at 6% compounded semiannually?
d) How long does it take $1700 to double if it is invested at 5% interest compounded continuously?

21. Find the equation of the line that is parallel to 3x+2y=4 that passes through the point (2,5).

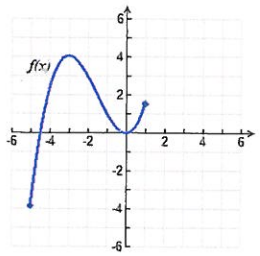
22. Find the equation of the line that is perpendicular to $y=\frac{3}{5}x - 4$ that passes though the point (-1,3).

23. For each of the following, calculate the difference quotient: $\frac{f(a+h)-f(a)}{h}$

a) $f(x) = -5x + 1$ b) $f(x) = 3x^2 - 2x + 1$

24. Use the binomial theorem to expand: a. $(x+1)^5$ b. $(2x+3)^4$

25. Use the graph of the function $f(x)$ to answer the following:



a. Domain:
b. Range:
c. On which interval(s) of x is $f(x)$ decreasing?
d. On which interval(s) of x *is* $f(x)$ increasing?
e. Determine a local minimum.
f. Determine a local maximum.

26. Graph each quadratic function by correctly finding its vertex and its x-intercepts and y-intercept.

a) $y = x^2 - 8x + 7$ b) $y = 3x^2 + 4x - 15$

27. Find the 3rd term in the binomial expansion of $(2x - 3)^5$

28. Determine whether the function is one-to-one. If so, state the inverse function.

a) $f(x) = 3x + 8$ b) $g(x) = (x - 4)^2$ c) $h(x) = x^3 + 2$