FINAL EXAM – Magnet Precalculus A/B
Name

Complete this exam to assess your learning from this year's math class. Concepts you are not strong in find the time this summer to review and strengthen your skills.
SEMESTER A

- Pre requisites (Linear functions, Quadratic functions)
- Properties of functions (domain, range, even and odd functions, increasing, decreasing, extreme, continuity, end behavior)
- Quadratic functions including complex solutions
- Complex numbers (operations)
- Radical functions. Connection between rational exponents and radicals
- Right triangle trigonometry
- Unit circle
- Trigonometric functions (graphs, key features, applications, transformations)
- Analytic trigonometry (identities, solving equations)
- Vectors (component form, magnitude, direction, dot product, angle between two vectors)
- Exponential , logarithmic and logistic functions (graphs, key features, transformations, applications)
- Polynomial functions

1) Solve the equation $x^2 + 14x = -9$ by completing the square.
2) Write the complex number $\frac{7+4i}{4-3i}$ in standard form (a + bi).
3) Write the equation of a line through the point $(-1, 2)$ and parallel to the line with equation $3x - 2y - 5 = 0$. Write the equation in point slope form and in general form.
4) Use the quadratic formula to solve $6x^2 - 4x + 5 = 0$
5) Find the domain and range of the function $f(x) = x^2 + \sqrt{x-5}$. Give your answer in interval notation.
6) Find the range of the function $f(x) = x^3 + \sqrt{x-2}$. Give your answer in interval notation.
7) Suppose the point $(3, -5)$ lies on a graph of an even function. Determine a second point on the graph.
8) Give an example of a discontinuous function and state why it is discontinuous.

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9) Which of these functions is one-to -one?

a. $f(x) = 2x^3 - 3x$

b. $f(x) = 6x + 14$

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

d. $f(x) = 5x^2 - x + 3$

e. $f(x) = \dfrac{x^2 - 7}{x - 1}$

10) Let $f(x) = 2x^3 - 3x^2 + 5x + 6$. Find an equation for g, the reflection of f across the y-axis.

11) Write the equation whose graph can be obtained from the graph of $y = x^2$ By a vertical stretching of factor 4, a reflection through the x-axis, and a vertical shift 5 units up.

12) Determine the domain of the real -valued function $f(x) = \ln(4 - x)$

$A. (0, \infty)$

$B. (4, \infty)$

$C. (-\infty, 4)$

D. [4, ∞)

E. ($-\infty$, -4]

13) Describe how the graph of $y = (2x + 2)^2$ can be obtained from the graph $y = x^2$.

14) Let $f(x) = \sqrt{2 - x}$

a. Why does f have an inverse that is a function?

b. Find a rule for $f^{-1}(x)$ And state it's domain.

15) What are the upper and lower bounds for the function $f(x) = \sin(x) + 2$

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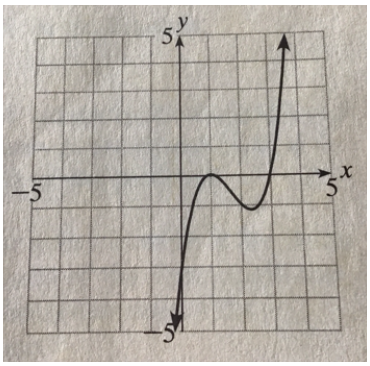
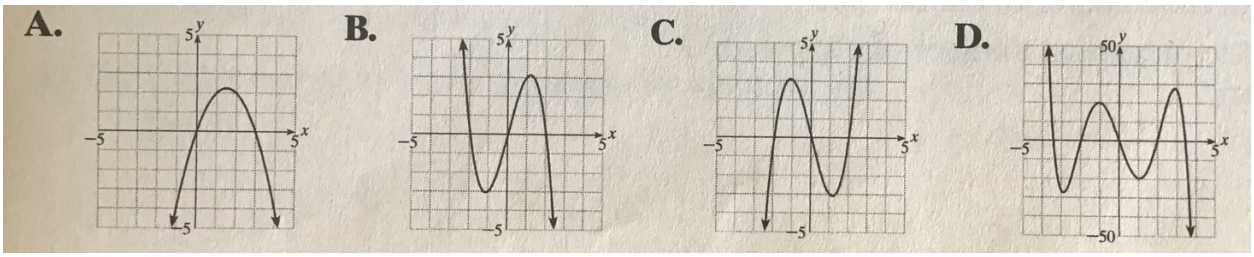
16) Which of the following gives the zeros of the graph and their multiplicity?

A. 1 (multiplicity 1), 3 (multiplicity 2)
B. 1 (multiplicity 3), 2 (multiplicity 1)
C. 1 (multiplicity 3), 3 (multiplicity 1)
D. 1 (multiplicity 2), 3 (multiplicity 1)
E. 1 (multiplicity 1), 2 (multiplicity 3)



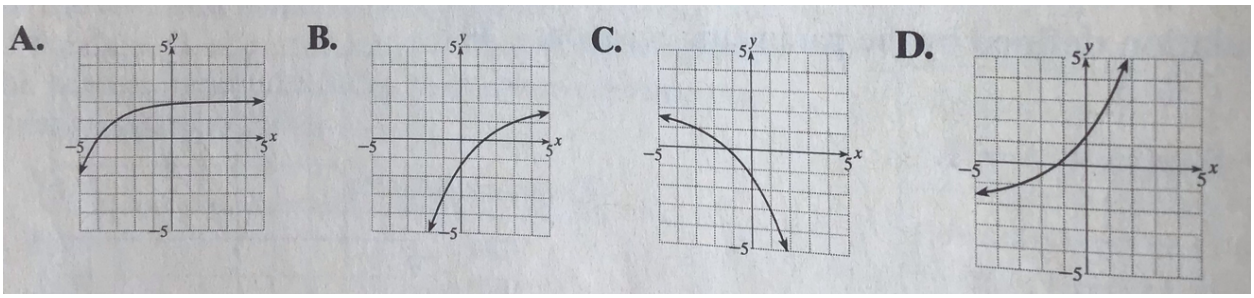
17) Find a polynomial of degree 2 with real-number coefficients and zero 3 – 2i.

18) Which of the following could represent a complete graph of $f(x) = ax - x^3$ where a is a real number?



19) For the function $y = 2\ln(x + 3)$, what is the inverse function, f^{-1} ?

20) The graph of $y = 2 - a^{x+3}$ for $a > 1$ is best represented by which graph?



21) Describe transformations that can be used to transform the graph of $\log(x)$ to a graph of $f(x) = 4\log(x + 2) - 3$.

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22) Ahmet invests $5000 at 8.2% for 14 years. If the interest is compounded monthly, what will the investment be worth in12 years?

23) Arturo invests $2700 in a savings account that pays 9.3% interest, compounded quarterly. If there are no other transactions, when will the balance reach $4550?

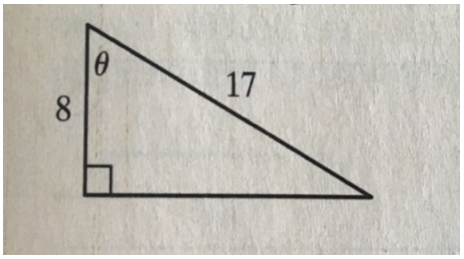
24) In a certain state park, the number of deer present after t years is modeled by the function $P(t) = \frac{1216}{1+75e^{-0.03t}}$

a. What was the initial population of the deer?

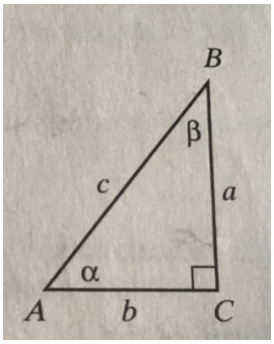
b. When will the population of the deer be 750?

c. What is the maximum number of deer possible in the park?

25) Evaluate the six trigonometric functions of the angle θ for the triangle given below.



26) Solve the right triangle ABC for all its unknown parts if $\beta = 38° \; and \; b = 4.5$.



27) Which transformation was NOT performed on $y = \sin(x)$ to obtain $y = -2\sin\left(3x + \frac{\pi}{3}\right)$?

a. Horizontal shift left by $\frac{\pi}{9}$ units?

b. Horizontal stretch by a factor of 3

c. Vertical stretch by a factor of 2

d. Reflection through the x-axis.

28) At the top of a radio signal tower there is an antenna with a light on the end of it. From a point on the ground 500 feet from the base of the tower, the angle of elevation to the tip of the light is $35.6°$ and the angle of elevation to the bottom of the antenna is $30.4°$. What is the height of the antenna, including the light?

29) Simplify $(\csc(x) - \tan(x)\sin(x)\cos(x) =$

a. $\sin(x) - cos^2(x)$

b. $\cos(x) - sin^2(x)$

c. $sin^2(x) + \cos(x)$

d. $cos^2(x) - \sin(x)$

30) State the amplitude, period, phase shift and the vertical translation of the sinusoid.

$y = 2 + 6sin\left(3x - \frac{\pi}{4}\right)$

31) Find all the solutions of the equation, $2\sin^2 x + 3\sin x - 2 = 0$ on the interval $[0, 2\pi)$. *Your answer should be* ***EXACT***.

32) Solve the equation $2\sin^2 x \cos x = \cos x$ by factoring and/or extracting square roots.

33) Confirm or disprove the following $2\cos x = \sin 2x$. If this is an identity, provide your proof. If it is not an identity, provide a counter example.

34) What is the area of triangle ABC if $a = 8,\ b = 10,\ and\ c = 15$?

35) Which of the following is not a valid completion of the double angle identity for $\cos 2\theta$.

a. $2\cos^2\theta - 1$

b. $1 - 2\sin^2\theta$

c. $\sin^2\theta - \cos^2\theta$

d. $\cos^2\theta - \sin^2\theta$

36) Rewrite the expression $\frac{\sqrt[7]{x^9}}{\sqrt[5]{x^6}}$ using a single radical.

37) Solve the equation $\log(x-6) + \log(x-3) = 1$. List any extraneous roots and explain.

38) For the next eight years, a small company's business volume can be modeled by the function $f(x) = 108(1.02)^x + 2\sin\frac{\pi x}{3}$, where x is the number of years after 2006 and f is the sales in millions of dollars.

a. What are the company's sales?

b. What does the model project for sales in 2011?

c. How many years are in each economic cycle for this company?

39) An airplane is flying on a bearing $23°$ east of north at 650 mph. Express the velocity of the airplane as a vector.

40) Determine whether the vectors $\langle 2,-1\rangle$ and $\langle -2,-5\rangle$ are **orthogonal**.

41) Find the **angle** between vector $u = \langle -2,5\rangle$ and $v = \langle 1,-3\rangle$.

42) Find the **components** of the vector $\boldsymbol{v}$ with direction $242°$ and length 5.

43) Let $\boldsymbol{u} = \langle -1,-1\rangle$. Find the vector $\boldsymbol{v}$ such that $\boldsymbol{u}\cdot\boldsymbol{v} = -6$ and $|\boldsymbol{v}| = \sqrt{18}$.