Advanced Math Final Exam - 2004 Name _____
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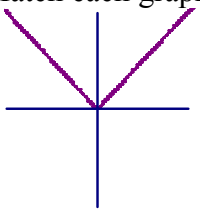
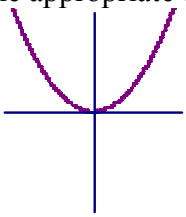
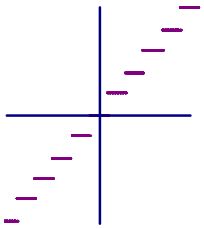
Instructions: Please show all work. If no work is shown partial credit will not be given. Write you name on any scrap paper you use and number problems.

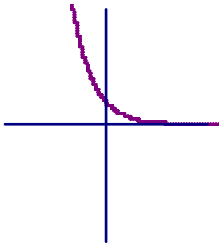
*Be sure to use **Degrees** and **Radians** mode appropriately for each problem!*

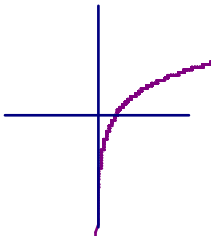
1. Match each graph with the appropriate type of function.

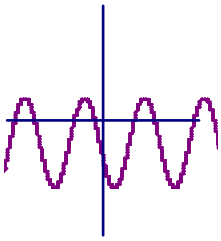
A. 

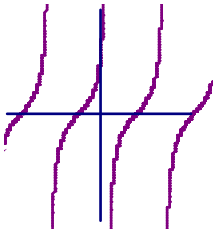
B. 

C. 

D. 

E. 

F. 

G. 

_____ $y = A\log_B x + D$
_____ $y = A(x-h)^2 + k$
_____ $y = A\tan(B(x+c)) + D$
_____ $y = A[B(x-C)] + D$
_____ $y = A|x-C| + D$
_____ $y = AB^{kX} + D$
_____ $y = A\cos(B(x+c)) + D$

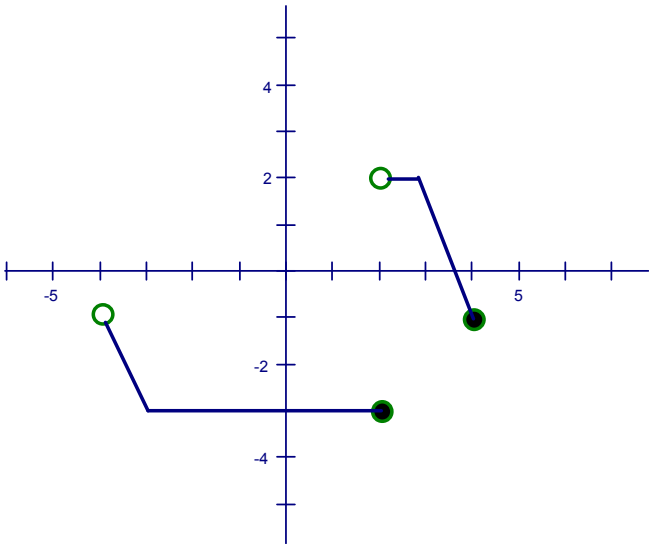
2. The graph below defines a function f. Determine the following:

a. $f(-3)$

b. $f(2)$

c. The domain of f

d. The range of f



3. Let $f(x) = 25 - x^2$, $g(x) = 5 - x$. Find the product $f(x) \cdot g(x)$ and its domain.

4. Given $f(x) = x^3$ and $g(x) = -5 - 6x$, find $f(g(x))$ and its domain.

a. $(-5-6x)^3$, all real numbers

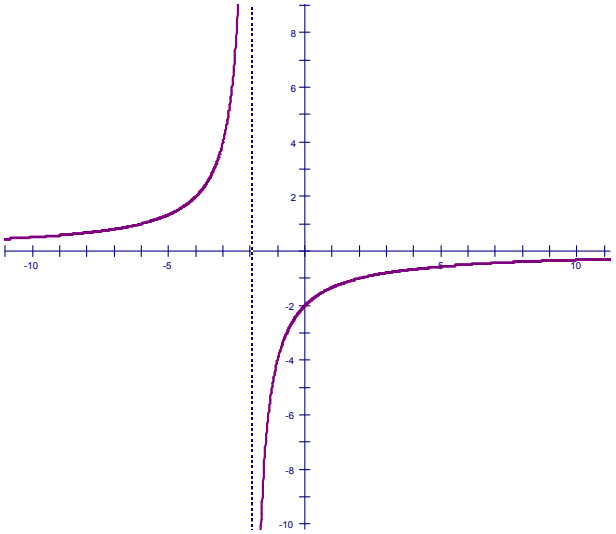
b. $(-5-6x^3)^3, x \neq \sqrt[3]{-\frac{5}{6}}$

c. $\frac{-5-6x}{x^3}, x \neq 0$

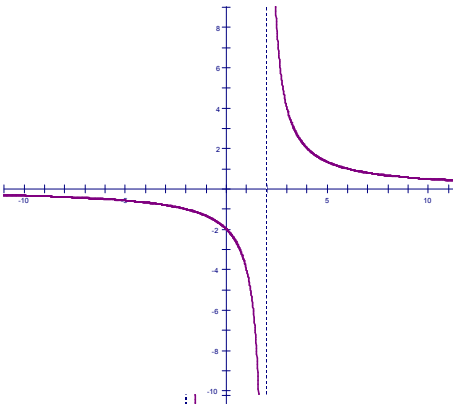
d. None of these.

5. In a right triangle find $m\angle A$ to the nearest degree if $\angle C$ is a right angle and b=15 and c=17.

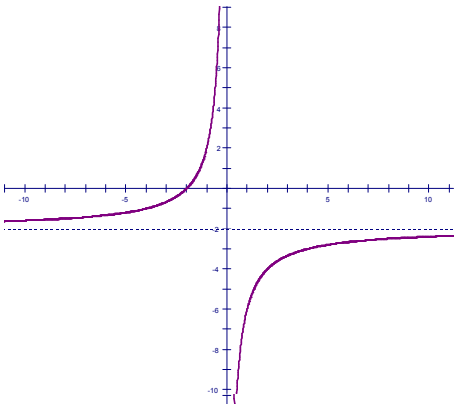
6. The graph of a function f is illustrated below. Which is the graph of the inverse function of f?



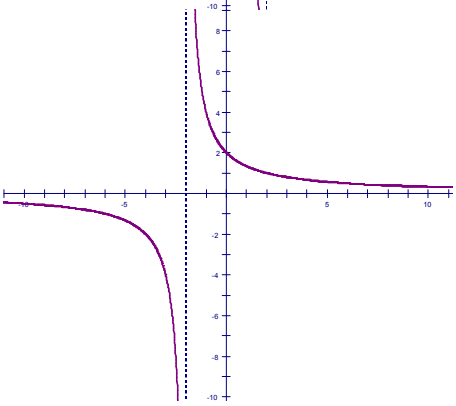
A.



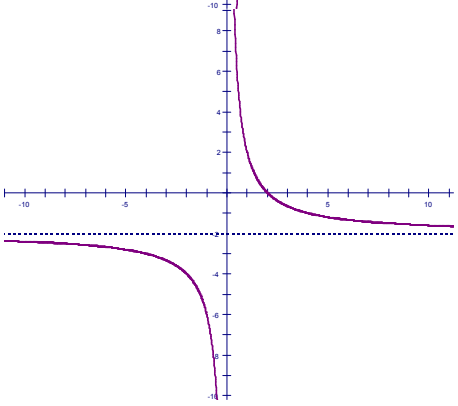
B.



C.



D.



7. An opinion poll is to have a margin of error (95% bounds) of ±3%. About how many people must be polled?

8. Find the zeros of the function $f(x) = 10x^4 + 11x^3 - 16x^2 - 11x + 6$.

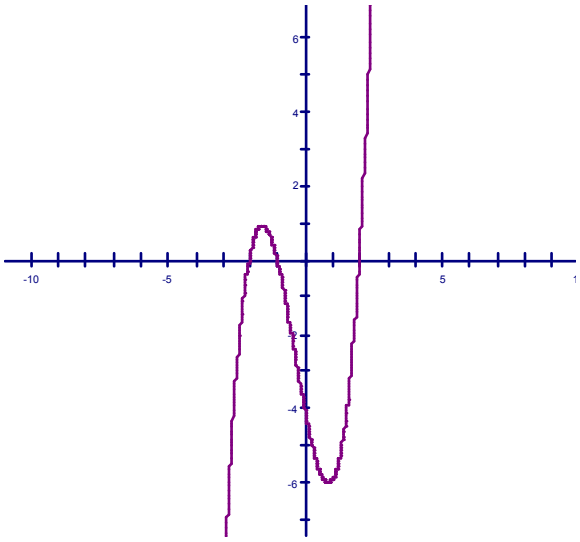
9. A complete graph of a polynomial function *g* is shown below.

   a. Is the degree of *g(x)* even or odd?

   b. Is the leading coefficient of *g(x)* positive or negative?

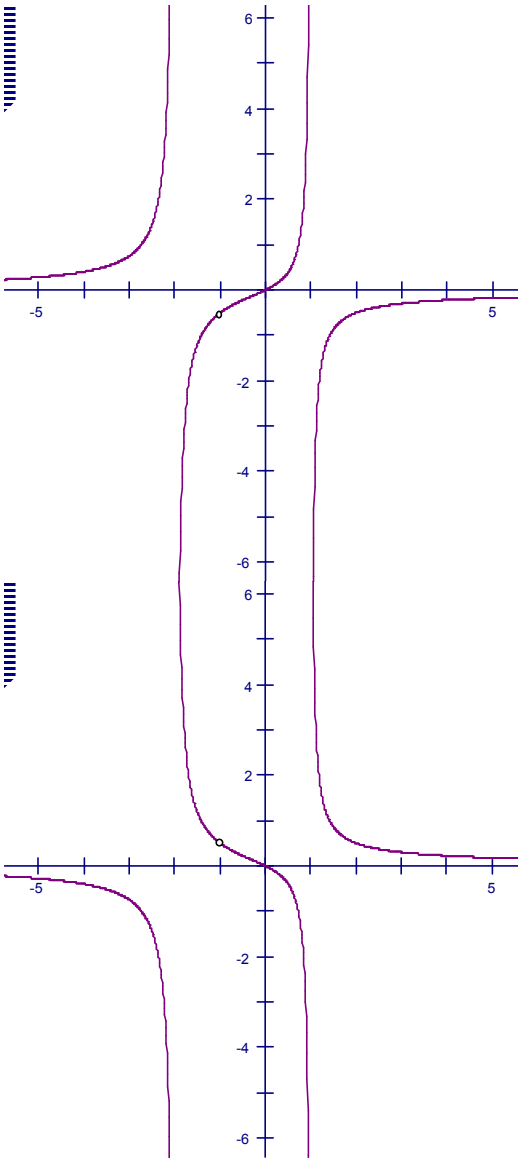
   c. What do the real zeros of *g(x)* appear to be?

   d. What is the smallest possible degree of *g(x)*?

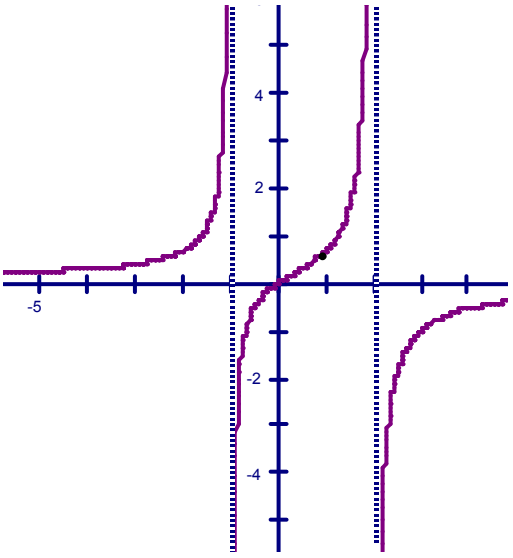


10. Which graph is the correct one, including all x-intercepts, holes and asymptotes of the function $y = \dfrac{x^2 - x}{(x+1)(x-2)(x-1)}$?

A.

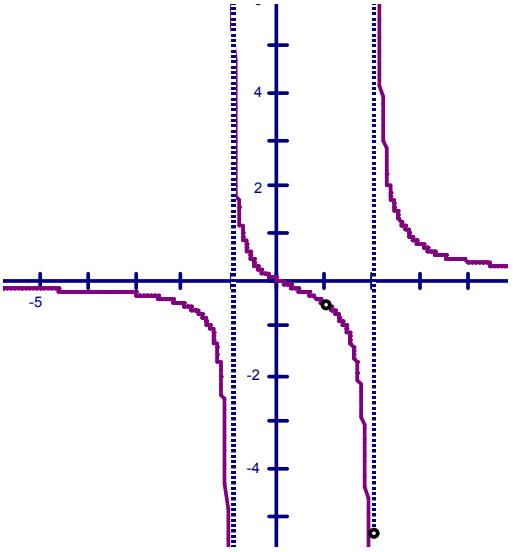


B.



C.

D.



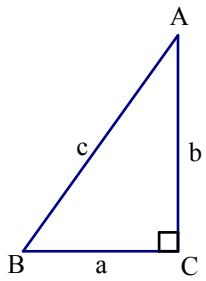
11. Solve for x. $10^x = 21$

A. x = 0.74 B. x = 2.1 C. x = 1.32 D. x = 2.30

12. In how many ways can the first three positions be determined in a horse race of 7 horses?

A. 5040 B. 35 C. 210 D. 343

13. Refer to the triangle below to solve a right triangle with $m\angle A = 25^\circ$ and a = 19 meters.



$\angle B =$

b =

c =

14. A pulley of radius 12 cm turns at 7 revolutions per second. Find the linear velocity of a point on the edge of the pulley in cm per second.

15. θ is an angle in standard position with point P(-4, -8) on the terminal side. Which statement is NOT correct?

A. $\cos\theta = -\frac{\sqrt{5}}{5}$ B. $\sec\theta = -\sqrt{5}$ C. $\cot\theta = 2$ D. $\sin\theta = \frac{-2\sqrt{5}}{5}$

16. Sketch the function $y = -3 + 2\cos(\frac{\pi}{6}(x+1))$ showing at least one full period and labeling four critical points per period.

Amplitude =
Period =
Vertical Translation =
Horizontal Shift =

17. The weights of adult Newfoundland dogs have approximately a normal distribution, with a mean of 140 pounds and a standard deviation of 20 pounds. Suppose that a Newfoundland is considered overweight if it weighs more than 170 pounds. What percentage of these dogs are overweight?

(A) about 5%

(B) about 7%

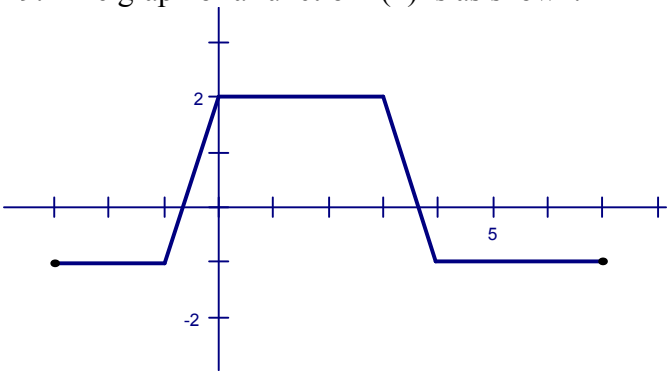
(C) about 10%

(D) about 20%

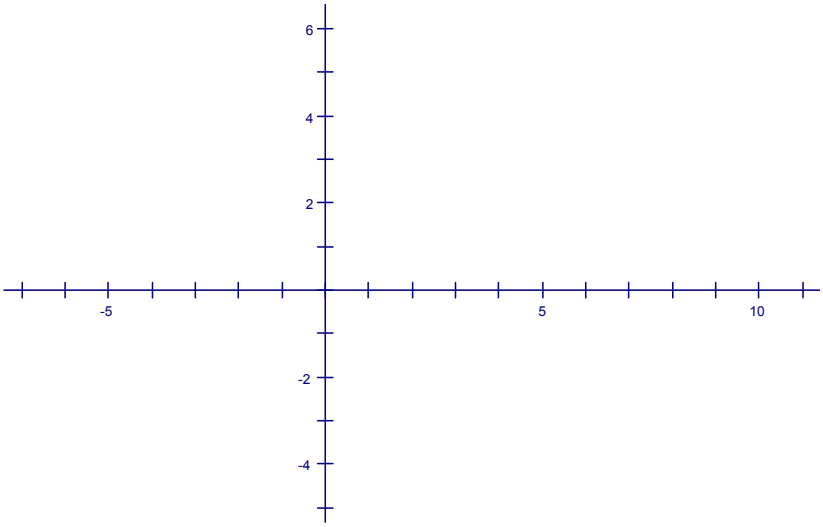
(E) about 30%

18. Find all angles θ that are solutions of $3\sin\theta=2$.

19. The graph of a function f(x) is as shown.



a. Sketch a graph of g(x) = f(x+2) – 3 and state the domain and range of g.



Domain of g(x): Range of g(x):

b. For each new transformation of f(x) describe the effect that the indicated value has on the graph:

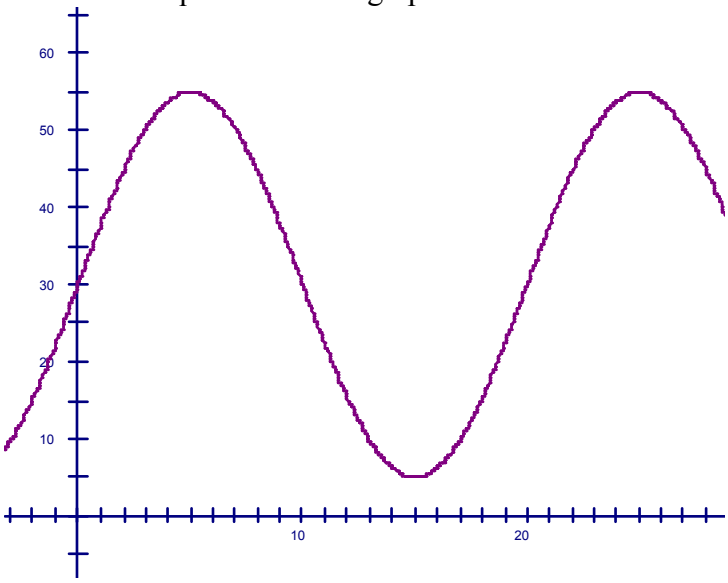
i. For h(x) = 5f(x-6) – 2 what is the effect of the number -2 on the transformation?

ii. For j(x) = -3f(-x+7) + 8 what is the effect of the negative sign in front of the 3 on the transformation.

iii. For j(x) = $2f(\frac{1}{6}(x+2)$ what is the effect of the number $\frac{1}{6}$ on the transformation?

20. Three cards are drawn without replacement from an ordinary 52 card deck (26 black and 26 red cards). What is the chance that they are, in order, black-red-black?

21. The graph below shows height as a function of time for a ride on a Ferris wheel. Choose the correct equation for the graph.



A. $y = 30 + 25\cos\left(\frac{2\pi}{20}x\right)$

B. $y = 30 + 25\sin\left(\frac{2\pi}{20}x\right)$

C. $y = 55 + 30\cos\left(\frac{2\pi}{20}(x-4)\right)$

D. $y = 55 + 30\sin\left(\frac{2\pi}{20}x\right)$

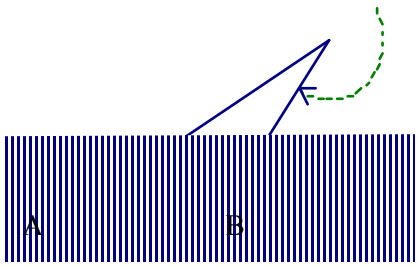
22. Prove the identity $\cos x + \sin x \tan x = \sec x$.

23. What is the simplified form of $\sin(x - 2\pi)$?

A. -sin x B. cos x C. -cos x D. sin x

24. Given $5 = 3\cos(\pi x) + 2.8$, find all solutions in radians..

25. Island A is 160 miles from Island B. A ship sails 310 miles from Island A and then finds that he is off course and 210 miles from Island B. What angle, in degrees, must he turn through to head straight for island B?



26. Given a triangle with a =4, A = 17º and B = 28º, what is c?

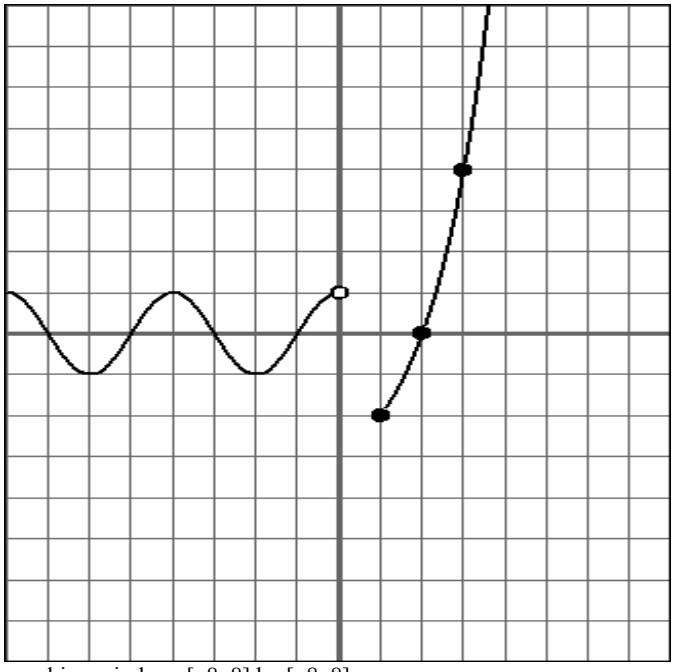
A. 9.7 B. 6.4 C. 0.6 D. 2.5

27. The SAT exam is designed to produce a mean score of 500 and a standard deviation of 100 points. Approximately what percentage of students score above 600?

28. A bag contains 5 red marbles and 10 blue ones. If three marbles are drawn without replacement what is the chance that one is red and two are blue?

29. A pizza ship offers toppings of mushrooms, pepperoni, onions, broccoli and liver. Customers can combine these in any way or choose none of them. How many pizza varieties can the shop advertise?

30. Below is a graph of a function $F(x)$, along with a table showing selected values of the function.



graphing window: [–8, 8] by [–8, 8]

x	$F(x)$
–6	–1
–4	1
–2	–1
0	undef.
1	–2
2	0
3	4

Identify the following limits. If a limit is not a finite number, give one of the following answers: $\infty, -\infty$, or undefined.

a. $\lim_{x \to 0^-} F(x) =$

b. $\lim_{x \to 0} F(x) =$

c. $\lim_{x \to +\infty} F(x) =$

d. $\lim_{x \to -\infty} F(x) =$