

Multiple choice section. Circle the correct choice(s). You do not need to show your work for these problems.

1. Which of the following is a factor of  $x^4 - x$ ? Circle all those that apply.

- (A)  $x$                       (B)  $x - 1$                       (C)  $x + 1$                       (D)  $x^2 + x + 1$                       (E)  $x^2 - x + 1$

2. How many roots does the equation below have?

$$x^2(x^2 - 3) - 4(x^2 - 3) = 0$$

- (A) 0                      (B) 1                      (C) 2                      (D) 3                      (E) 4

3.

$$\frac{1 + \frac{1}{x}}{1 - \frac{1}{x}} =$$

- (A)  $\frac{x+1}{x-1}$                       (B)  $\frac{x-1}{x+1}$                       (C)  $x-1$                       (D)  $1-x$                       (E)  $x$

4. What is the radius of the circle whose equation is  $x^2 - 8x + y^2 + 6y = 24$ ?

- (A) 4                      (B)  $\sqrt{24}$                       (C) 5                      (D) 6                      (E) 7

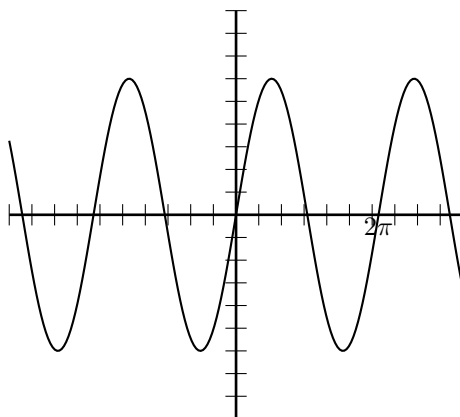
5. Which of the following is a solution to  $2(5 - 3x) - 2.5 - 3x = 108$ ? Circle all that apply.

- (A) -12                      (B) -9                      (C) -2                      (D) 0                      (E) none of these

6. Which of the following is a solution to  $3(x - 2)^2(x + 1) - 2(x - 2)^2(x + 1)^3 = 0$ ? Circle all that apply.

- (A) -2                      (B) -1                      (C) 0                      (D) 2                      (E) 8

7. Consider the function  $y = a \sin(bx)$ , where  $a$  and  $b$  are constants, shown below. What is  $a + b$ ? (Tick marks are located at unit positions.)



- (A) 2                      (B) 4                      (C) 5                      (D) 6                      (E) 7

8. Suppose the functions  $f$  and  $g$  are given completely by the table of values shown below.

$x$	$f(x)$	$x$	$g(x)$
0	2	0	5
1	7	1	7
2	5	2	4
3	1	3	2
4	3	4	6
5	6	5	3
6	0	6	1
7	4	7	0

What is  $g^{-1}(f(3))$ ?

- (A) 1                      (B) 3                      (C) 4                      (D) 5                      (E) 6

9. Referring again to the two functions in the previous question, solve the equation  $g(f(g(x))) = 5$  for  $x$ .  
(A) 1                      (B) 2                      (C) 3                      (D) 4                      (E) 5

On all the following questions, **Show your work.**

10. Find the (implied) domain of the function  $g(x) = \frac{\sqrt{x+1}}{x^2-9}$ . Write your answer using interval notation.
11. Let  $f(x) = x^2 - x$ . Compute in simplify  $f(4)$ ,  $f(x+1)$ ,  $f(x+h)$ , and  $\frac{f(x+h) - f(x)}{h}$  where  $h \neq 0$ .
12. The slope of the tangent line to the graph of  $f(x) = 2x^2 - x$  at the point  $(1, 1)$  is 3. Find an equation for this tangent line.
13. (Why not?) Sketch the curve below represented parametrically by  $x = t - \sin(2t)$ ,  $y = t + \cos(t)$  for  $-2 \leq t \leq 2$  on the grid provided.

