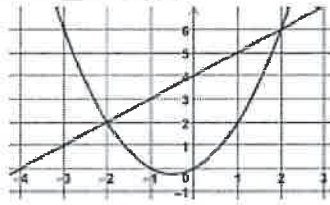


2022 IM3 EOC Practice Test (from Mastery Connect)

1. The graphs of functions $f(x)$ and $g(x)$ are shown on the coordinate plane. Select the solution(s) for $f(x) = g(x)$. Select all that apply.

- A 2
- B 0
- C 6
- D -2
- E -1



2. If a is a solution to $f(x) = g(x)$, which must be true? (Assume a and d are constants)

- A $f(0) = a$ and $g(0) = a$
- B $f(d) = a$ and $g(d) = a$
- C $f(a) = d$ and $g(a) = d$
- D $f(a) = d$ and $f(d) = a$

3. Joseph is trying to find a way to use technology to solve for the real solutions of any equation, $f(x) = g(x)$. Joseph knows he needs to graph both $f(x)$ and $g(x)$ in his calculator. Which of the following strategies would help him find the solutions?

- A Find the x -value of each intersection point of $f(x)$ and $g(x)$.
- B Find the y -value of each intersection point of $f(x)$ and $g(x)$.
- C Find the x -values where $f(x) > g(x)$.
- D Find the x -values where $f(x) = 0$ or $g(x) = 0$.

4. Consider the table below.

x	$f(x)$	$g(x)$
-2	4	-3
0	7	-2
3	10	10
7	13	22
11	16	31

For what value of x is $f(x) = g(x)$?

- A 3
- B 10
- C 17
- D Not enough information

For which x -value are the y -values the same?

5. Given the functions $h(x) = |x + 2| - 1$ and $k(x) = -x^2 + 3x + 2$, which interval contains a value of x for which $h(x) = k(x)$?

- A $-4.5 < x < -3$
- B $-2 < x < -1.5$
- C $-1.5 < x < 1.5$
- D $3 < x < 5$

6. Simplify $\frac{x^2 + 2x - 24}{3x + 18}$.

- A $\frac{x-4}{3x+6}$
- B $\frac{x+6}{3x+6}$
- C $\frac{x-4}{3}$
- D $\frac{x^2 + 2x - 4}{3x + 18}$
- E $\frac{x-6}{3}$

7. The 5th term of the sequence is 32. Each term is two times the previous term. Which of these explicit functions would model the general term of the sequence $f(n)$. Select All.

- A $f(n) = 32(5)^{n-2}$
- B $f(n) = 32(2)^{n-5}$
- C $f(n) = 2^n$
- D $f(n) = 16(2)^{n-4}$
- E $f(n) = 4(2)^{n-2}$

If I plug in 5, which of these = 32?

8. Factor $2a^4 - 5a^2b^2 - 3b^4$.

- A $(2a^2 + b^2)(a^2 + 3b^2)$
- B $(2a^2 + b^2)(a^2 - 3b^2)$
- C $(2a^2 - b^2)(a^2 + 3b^2)$
- D $(2a^2 + b^2)(a^2 + 3b^2)$

Consider the signs first!

$81^{x+4} = 9^{5x}$

9. Which equations are equivalent to $81^{x+4} = 9^{5x}$? Select All.

- A $9^{x+6} = 9^{5x}$
- B $3^{4x+16} = 3^{10x}$
- C $9^{2x+8} = 9^{5x}$
- D $3^{4x+16} = 3^{10x}$
- E $9^{x+4} = 9^{5x}$

10. What is the remainder when $f(x) = x^3 + 5x^2 - 9x - 7$ is divided by $(x + 2)$?

- A -2
- B 7
- C 3
- D -10
- E 23

11. $\frac{h(x)}{x-3}$ produces a remainder of 2. Which is true?

- A $h(2) = 3$
- B $h(3) = 2$
- C $h(-3) = -2$
- D $h(2) = -3$
- E $h(-2) = 3$

$\frac{h(x)}{x-3}$

12. Let $f(x) = 5x^2 - 36$. What is the remainder when dividing by $x - 6$?

- A 144
- B 89
- C -6
- D -36
- E 16

13. Which of the following is a circle with radius 7 and center $(-3, 4)$?

- A $(x - 3)^2 + (y + 4)^2 = 7$
- B $(x + 3)^2 + (y - 4)^2 = 7$
- C $(x - 3)^2 + (y + 4)^2 = 49$
- D $x^2 + y^2 = 7$
- E $(x + 3)^2 + (y - 4)^2 = 49$

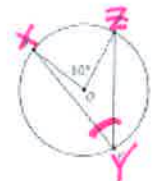
14. Which of the following is a circle with a diameter of 6?

- A $(x - 3)^2 + (y + 12)^2 = 6$
- B $(x - 6)^2 + (y + 6)^2 = 3$
- C $(x - 3)^2 + (y + 3)^2 = 9$
- D $(x - 7)^2 + (y + 2)^2 = 36$
- E None of the above

15. Circle O is shown to the right. What is the measure of $\angle XYZ$?

- A 40°
- B 60°
- C 80°
- D 160°
- E. There is not enough information

Central angle $\theta = 80^\circ$



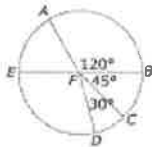
16. A circular pool has a surface area of 63.62 square yards. Which best represents the diameter of the pool?

- A 9
- B 10
- C 11
- D 12
- E 8

17. The circle with center F is divided into sectors. In circle F, \overline{EB} is a diameter. The length of \overline{FB} is 3cm.

What is the area of the sector formed by $\angle EFC$?

- A 8.1 B 9.8 C 7.9 D 10.6 E 5.6



18. One of the factors of $R(x) = x^4 + 2x^3 - 5x^2 - 6x$ is $(x - 2)$. What are all the zeros of the function $R(x)$?

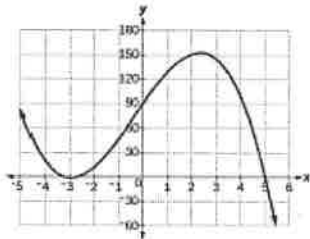
- A $x = -3, -1, 2$ C $x = -3, -1, 0, 2$
 B $x = -2, 0, 1, 3$ D $x = -1, 0, 2, 3$ E $x = -3, 0, 2$

19. Which of these are zeros of $x^4 + 3x^3 - 4x^2 - 12x$? Choose the 4 that apply.

- A -3 B -2 C -1 D 0 E 2

20. Which function could accurately represent the graph below of $f(x)$?

- A $f(x) = -2(x + 3)^2(x + 5)$
 B $f(x) = -2(x - 3)(x + 5)^2$
 C $f(x) = -2(x - 3)^2(x - 5)$
 D $f(x) = -2(x + 3)^2(x - 5)$



21. Which of the following is the solution to $50 = 40e^{0.027t}$?

- A $\frac{\ln(1.25)}{0.027}$ C $\ln\left(\frac{1.25}{0.027}\right)$ E $\ln\left(\frac{0.027}{1.25}\right)$
 B $0.027 \ln(1.25)$ D $1.25 \ln(0.027)$

$$-4e^{x-3} = 7$$

$$50 = 40e^{0.027t}$$

22. Solve $-4e^{x-3} = 7$.

- A 0.34 B -0.76 C 1.24 D 6.13 E No Solution

23. Which of the following equations is perpendicular to $4x + 3y = 12$? (Select One)

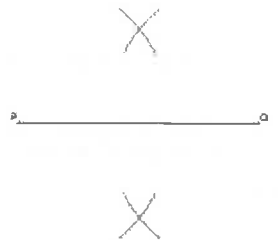
- A $y = \frac{3}{4}x - 7$ C $y = -\frac{3}{4}x + 6$
 B $y = \frac{4}{3}x - 5$ D $y = -\frac{4}{3}x + 4$

24. Which of the following equations is not parallel to the line $y = -\frac{1}{2}x + 7$?

- A $y = -\frac{x}{2} - 3$ C $y = -0.5x + 6$
 B $y = \frac{x+7}{-2}$ D $y = -2x + 7$

25. What is being constructed to the right?

- A Angle Bisector
 B Parallel Line
 C Perpendicular Bisector
 D Parallelogram



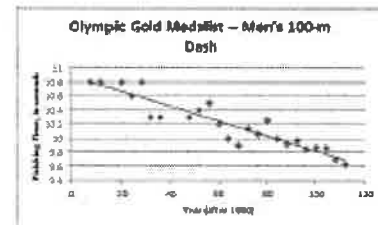
26. A cylindrical can holding sausages has a radius of 5cm and a height of 4cm. The can contains 10 cylindrical sausages, each having a radius of 1.5cm and a height of 3.85cm. What is the volume inside the can, not taken up by the sausages?

- A 42 cm^3 B 314 cm^3 C 207 cm^3 D 23 cm^3 E 112 cm^3

27. Fishermen have been studying how the number of dead fish in the local lake is related to the pollution index of the lake. The number of fish deaths per year is modeled by $f(x) = 8.7x + 91.4$. Which value represents the slope and what does it mean in the context of the scenario?

- A 8.7, number of fish deaths per year when the pollution index is 0
 B 91.4, number of fish deaths per year when the pollution index is 0
 C 91.4, number of years
 D 8.7, number of fish deaths that occur with an increase of 1 in the pollution index

28. The scatterplot below shows the finishing times for the Olympic gold medalist in the men's 100-meter dash for many previous Olympic games. The line of best fit is also shown.



Which of the following best describes the relationship between the two quantities shown?

- A On average, an increase in 20 years resulted in roughly 2 tenths of a second decrease in finishing time.
 B The y-intercept of the line of best fit is approximately 10.9 seconds, which represents the time it took the gold medalist in 1910.
 C It can be assumed that by year 2040, the finishing time will reach 0.
 D Every 10 years the running distance decreased by 3 meters.

29. A person's batting average is determined by dividing the number of hits by the number of bats. William has 11 hits in 53 at bats and has a batting average of 0.208. He wants to have a batting average of at least 0.300. Which equation could be used to determine x , the number of hits in a row William needs to get in order to have a batting average of at least 0.300?

- A $0.300 \leq \frac{11+x}{53+x}$ C $0.300 \leq \frac{11+x}{53}$
 B $0.300 \leq \frac{11}{53}$ D $0.300 \leq \frac{11+x}{53+x}$

30. (#29 continued) How many hits in a row would William have to hit to have a batting average of exactly 0.300?

- A 3 B 4 C 7 D 9 E 11

31. DeShawn is in his fifth year of employment as a patrol officer for Metro Police. His salary for his first year of employment was \$47,000. Each year after the first, his salary increased by 4% each year. Approximately how much did DeShawn make over his first five years of service?

- A \$10,184 C \$237,506 E \$254,567
 B \$245,184 D \$261,345

year 1
 + year 2
 + year 3
 + year 4
 + year 5
 ?

32. What is the quotient of $\frac{12x^3 + 20x^2}{12x - 4}$?

- A $x^2 + \frac{4}{3}x - \frac{4}{9} + \frac{4}{27x-9}$ D $x^2 + 2x - \frac{2}{3} + \frac{-2}{9x-3}$
 B $x^2 + 2x + \frac{2}{3} + \frac{2}{9x-3}$ E $x^2 - \frac{4}{3}x - \frac{4}{9} + \frac{4}{27x-9}$
 C $x^2 + \frac{4}{3}x + \frac{4}{9} + \frac{4}{27x-9}$

$12x^3 + 20x^2$
 $12x - 4$

33. Consider the functions $f(x)$, $g(x)$ and $h(x)$.

$f(x) = x^3 - 9x^2 - 4x + 2$

$g(x) = -2x^3 + 5x^2 + 2x - 1$

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

Place a check mark in the appropriate box within the table that describes the end behavior of each function as $x \rightarrow \infty$. Select the letters where you would normally place a check mark (one per column).

	$f(x)$	$g(x)$	$h(x)$
Increasing	A	B	C
Decreasing		D	E

34. Point C lies on \overline{AB} . A is at (2,4) and B is at (10,16). If the ratio of the length \overline{AC} to the length of \overline{CB} is 3:1, what is the y-coordinate of point C?

- A 9 B 13 C 6 D 7 E 11

35. Kenny purchases heavy machinery for \$28,500. The value of the tractor depreciates at a value of 7.3% annually. Which function represents the value of the tractor with an approximate equivalent monthly depreciation rate?

- A $f(t) = 28,500(1.073^{\frac{1}{12}})^t$ C $f(t) = 28,500(1.073^{\frac{1}{12}})^{12t}$
 B $f(t) = 28,500(0.927^{\frac{1}{12}})^{12t}$ D $f(t) = 28,500(0.927^{\frac{1}{12}})^t$

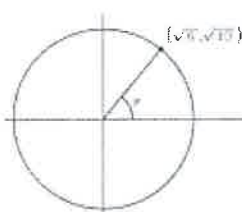
36. In a region of the Caribbean Sea, daily water temperatures are normally distributed with a mean of 77.9 and a standard deviation of 2.4. What is the probability a randomly selected daily temperature is less than 73.1?

- A 97.5% B 95% C 5% D 2.5% E 1.25%

37. In a region of the Caribbean Sea, daily water temperatures are normally distributed with a mean of 77.9 and a standard deviation of 2.4. What is the probability a randomly selected daily temperature is less than 82.7?

- A 97.5% B 95% C 5% D 2.5% E 1.25%

38. What is the sine of the angle pictured below?



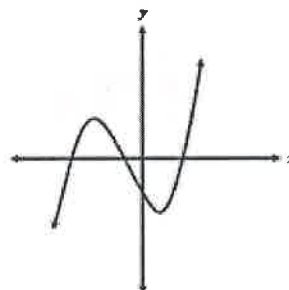
$(\sqrt{6}, \sqrt{10})$

- A $\frac{\sqrt{10}}{6}$ B $\frac{\sqrt{6}}{4}$ C $\frac{\sqrt{6}}{10}$ D $\frac{\sqrt{10}}{4}$ E $\frac{\sqrt{7}}{6}$

39. A circle has a radius of 4cm. How many radians would an arc length of 24cm be?

- A 4 B 12 C 24 D 6 E 3

40. Consider the graph of a polynomial function, $f(x)$, with x-intercepts at (-8, 0), (-3, 0), and (6, 0) and a y-intercept at (0, -4).



If the lead coefficient of $f(x)$ is greater than 0, which statement is true?

- A The polynomial has a degree of 3 and a factorization of $(x - 8)(x - 3)(x + 6)$.
 B The polynomial has a degree of 3 and a factorization of $(x - 6)(x + 3)(x + 8)$.
 C The polynomial has a degree of 4 and a factorization of $(x - 8)(x - 4)(x - 3)(x + 6)$.
 D The polynomial has a degree of 4 and a factorization of $(x - 6)(x + 3)(x + 4)(x + 8)$.

41. Which best describes the graph of the equation $y = 3(0.2)^x + 4$?

- A An exponential growth with a y-intercept of (0,3) and an asymptote of $y = 4$.
 B An exponential decay with a y-intercept of (0,4) and an asymptote of $y = 3$.
 C An exponential growth with a y-intercept of (0,4) and an asymptote of $y = 3$.
 D An exponential decay with a y-intercept of (0,3) and an asymptote of $y = 4$.

42. Assuming an exponential function fits this data, about how many coins would be returned after the 10th trial?

A box containing 1,000 coins is shaken, and the coins are emptied onto a table. Only the coins that land heads up are returned to the box, and then the process is repeated. The accompanying table shows the number of trials and the number of coins returned to the box after each trial.

Trial	0	1	2	3	4	5
Coins Returned	1000	610	220	132	81	51

- A 16 B 6 C 4 D 2 E 1

1000
 610
 220
 132
 81
 51
 45

43. The graph shows the exponential growth of the number of organisms in a Petri dish over a 12-hour period.

Time (hours)	Number of Organisms
0	25
2	36
4	52
6	68
8	88
10	104
12	151

To the nearest whole organism, how many are expected to be in the Petri dish at 24 hours?

- A 198
 B 451
 C 849
 D 1042

44. Country A has a population of 3,002,859 and an area of 28,748km². Country B has a population of 45,239,079 and an area of 1,138,910km². Which of the following is a true statement?

- A Country A has a greater population density than Country B.
- B Country B has a greater population density than Country A.
- C Country A and Country B have equal population densities.
- D Not enough information to determine which country has a greater population density.

45. A block of copper metal in the form of a rectangular prism weighs 480g. The dimensions of the block are 8 cm by 5 cm by 4 cm. From this data, what is the density of copper?

- A 0.3 g/cm³
- B 3.0 g/cm³
- C 7.9 g/cm³
- D 16.0 g/cm³

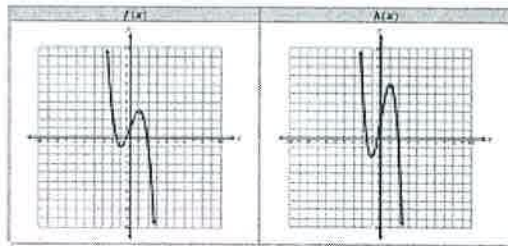
Look at the units on the answers...

46. Millie is solving for h in the equation $9^{3h} = 41$. Which best describes the first step in solving this equation?

- A $3h = \frac{41}{9}$
- B $9^h = \frac{41}{3}$
- C $\log_9(41) = 3h$
- D $\log_9(3h) = 41$

$$9^{3h} = 41$$

47. Consider the function $f(x)$ and its transformation $h(x)$, as shown in the table below.



Which function represents $h(x)$ as a transformation of $f(x)$?

- A $h(x) = f(x) + 3$
- B $h(x) = f(x + 3)$
- C $h(x) = f(2x)$
- D $h(x) = 2f(x)$

48. A quadrilateral has coordinates $(-2, -5)$, $(0, 3)$, $(10, 3)$, and $(8, -5)$. Which best describes the quadrilateral?

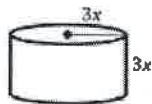
- A a parallelogram that is not a rhombus
- B a rectangle that is not a square
- C a rhombus that is not a square
- D a trapezoid that is not a parallelogram

$$51^3 - 34^3$$

49. A student rewrites the expression $51^3 - 34^3$ in order to evaluate the expression. Which could be the expression the student writes?

- A $(51 - 34)(51 + 34)$
- B 17^3
- C $(51^2 - 34^2)(51^2 + 34^2)$
- D $(51 - 34)(51^2 + 51(34) + 34^2)$

50. A vase is in the shape of a right cylinder with both radius and height of $3x$ units.



$$V = 27x^3\pi$$

If $V = 27x^3\pi$ represents the volume of the cylinder, in cubic units, which represents the equation when solved for x ?

- A $x = \sqrt{\frac{27\pi}{V}}$ → $x = \sqrt[3]{\frac{27\pi}{V}}$
- B $x = \sqrt{\frac{27\pi}{V}}$ → $x = \sqrt{\frac{27\pi}{V}}$
- C $x = \sqrt{\frac{V}{27\pi}}$ → $x = \sqrt[3]{\frac{V}{27\pi}}$
- D $x = \sqrt{\frac{V}{27\pi}}$

$$x = \sqrt[3]{\frac{V}{27\pi}}$$