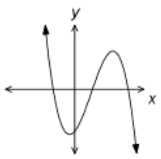
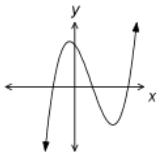
24. Which graph best represents a function with the characteristics listed below?

- Three x-intercepts
- Extending from Quadrant II to Quadrant IV

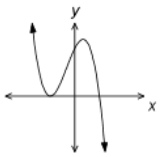
(A)



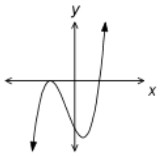
(B)



(C)



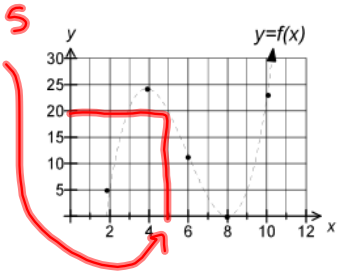
(D)



25. Given the table, the scatter plot and the curve of best fit of the polynomial $f(x)$, what is the value of $f(5)$?

x=5

x	y
2	5
4	24
6	12
8	0
10	23



(A) 2
(B) 9
(C) 18
(D) 20

26. From which quadrants does the graph of $f(x) = x^3 + 3x^2 - 4$ extend?

(A) II to I
(B) II to IV
(C) III to I
(D) III to IV

positive cubic

27. Which function passes through the point $(1, -7)$?

$-(1)^3 - 3(1)^2 + (1) - 4$
$-1 - 3 + 1 - 4$
$= -7$

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

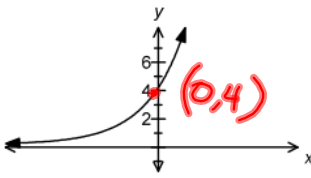
check in each equation

28. Which is a decreasing exponential function?

$a(b)^x$
$0 < b < 1$

(A) $f(x) = \frac{1}{3}\left(\frac{5}{2}\right)^x$
(B) $f(x) = 0.5(1.5)^x$
(C) $f(x) = \frac{3}{2}(1)^x$
(D) $f(x) = 2\left(\frac{3}{4}\right)^x$

29. Which exponential function best represents the graph shown?



(0,4) y-intercept

(A) $f(x) = \left(\frac{1}{4}\right)^x$
(B) $f(x) = (4)^x$
(C) $f(x) = 4\left(\frac{1}{4}\right)^x$
(D) $f(x) = 4(4)^x$

30. The population of a strain of bacteria growing in a Petri dish is modeled by the function $P(t) = 3000(2)^{\frac{t}{4}}$ where $P(t)$ represents the number of bacteria and t represents the time in hours after the initial count. How much time will it take for the number of bacteria to reach 12 000?

(A) 4 h
(B) 8 h
(C) 16 h
(D) 32 h

$\frac{12000}{3000} = \frac{3000(2)^{t/4}}{3000}$
$4 = 2^{t/4}$
$2^2 = 2^{t/4}$
$2 = \frac{t}{4}$
$8 = t$

31. Solve for x: $2^{3x+1} = 4^{2x-1}$

(A) -3
(B) -2
(C) 2
(D) 3

$2^{3x+1} = (2^2)^{2x-1}$
$2^{3x+1} = 2^{4x-2}$
$3x+1 = 4x-2$
$3x-4x = -2-1$
$-x = -3$
$x = 3$

32. Which is true of the table given below?

x (years)	0	3	6	9	12
y (amount)	10	20	40	80	160

every 3 ~ double

	Initial Amount	Amount Growth
(A)	10	doubles every three years
(B)	10	triples every two years
(C)	20	doubles every three years
(D)	20	triples every two years

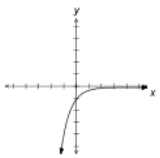
33. The function that models the decay of carbon-14 is $A(t) = 100\left(\frac{1}{2}\right)^{\frac{t}{5730}}$, where $A(t)$ is the number of grams of carbon-14 present at time t, in years. Which statement is true?

(A) The amount of carbon-14 doubles every 5730 years.
(B) There are 50 g of carbon-14 present initially.
(C) 14 g will be present after 50 years.
(D) 50 g of carbon-14 will be present after 5730 years.

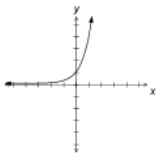
½ of 100

34. Which graph best represents $y = 2\ln x$?

(A)

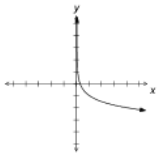


(B)

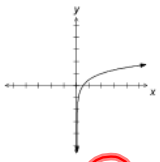


exp. growth

(C)



(D)



35. What is $\log_3 32 - 2\log_3 4$ written as a single logarithm?

(A) $\log_3 2$
(B) $\log_3 4$
(C) $\log_3 16$
(D) $\log_3 24$

$\log_3 4^2$ → laws of logs

$\log_3 32 - \log_3 16$

$\log_3 \frac{32}{16} = \log_3 2$

36. Evaluate: $\log_3\left(\frac{1}{243}\right) = x$

(A) −81
(B) −5
(C) 5
(D) 81

$3^x = \frac{1}{243}$ $3^5 = 243$

^
y^x

37. What is the logarithmic form of $C = 5^d$?

(A) $d = \log_5 C$
(B) $d = \log_C 5$
(C) $C = \log_5 d$
(D) $C = \log_d 5$

↑base

$\log_5 C = d$

exponent

38. Solve for x: $4^{x+1} = 7$

(A) $\frac{\log 4}{\log 7} - 1$

(B) $\frac{\log 7}{\log 4} - 1$

(C) $\frac{\log 4 - 1}{\log 7}$

(D) $\frac{\log 7 - 1}{\log 4}$

$\log 4^{x+1} = \log 7$

$x+1 = \frac{\log 7}{\log 4}$ $\quad x = \frac{\log 7}{\log 4} - 1$

39. The equation $A(t) = A_0\left(\frac{1}{2}\right)^{\frac{t}{3}}$ represents a radioactive sample after t years. How much time will it take for 15% of the sample to remain?

If $A_0 = 1$, 15% of 1

If $A_0 = 100$, then $A(t) = 15$

$15 = 100\left(\frac{1}{2}\right)^{t/3}$

$\frac{15}{100} = \frac{1}{2}^{t/3}$

$.15 = 0.5^{t/3}$

$\log 0.15 = \frac{t}{3}\log 0.5$

$\frac{\log 0.15}{\log 0.5} = \frac{t}{3}$

$2.736 = \frac{t}{3}$

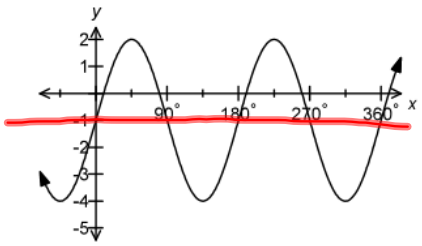
(A) 0.7 years

(B) 0.9 years

(C) 8.2 years

(D) 10.0 years

40. What is the midline equation for the graph shown below?



(A) $y = -4$

(B) $y = -1$

(C) $y = 0$

(D) $y = 2$

41. What are the amplitude and maximum value for the function $f(x) = 2\sin 3(x + 60°) + 1$?

amp

	Amplitude	Maximum Value
(A)	2	3
(B)	2	4
(C)	3	3
(D)	3	4

42. The graph of which function has a period of 180°?

$\frac{360}{b} = 180$

$b = 2$

$\cos b(x)$

(A) $y = 3\cos\frac{1}{2}x - 1$

(B) $y = 3\cos(x - 180°) - 1$

(C) $y = 4\cos(x + 180°) + 1$

(D) $y = 4\cos 2x + 1$

43. What is $\frac{4\pi}{9}$ radians in degrees?

(A) 45°
(B) 80°
(C) 160°
(D) 405°

$\frac{4(180)}{9} =$

44. What is the domain of the function $y = 4\cos x + 2$?

(A) $\{x | -2 \le x \le 6, x \in R\}$
(B) $\{x \in R\}$
(C) $\{y | -2 \le y \le 6, y \in R\}$
(D) $\{y \in R\}$

45. The graph of the function $y = 4\cos 3x$ has its amplitude doubled and its period halved. Which represents the new function?

(A) $y = 2\cos\frac{3}{2}x$
(B) $y = 2\cos 6x$
(C) $y = 8\cos\frac{3}{2}x$
(D) $y = 8\cos 6x$

amp = 4 ⇒ 8
period = $\frac{360}{3} = 120^\circ$ ≈ 60°
$\frac{360}{6} = 60$

46. The interest rate on the loan shown in the chart below is 5% compounded monthly. How much of the second payment is the interest toward the loan?

Payment Period (month)	Payment ($)	Principal Paid ($)	Balance ($)
0			15,000
1	450	387.50	14,612.50
2	450	389.11	14,223.39
3	450	390.74	13,832.65

(A) $59.26
(B) $60.89
(C) $62.50
(D) $182.65

47. 312 bi-weekly payments are required to pay off a loan. How many years does this represent?

(A) 6 years
(B) 12 years
(C) 13 years
(D) 26 years