Cron

4
5

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.

Where do they intersect?

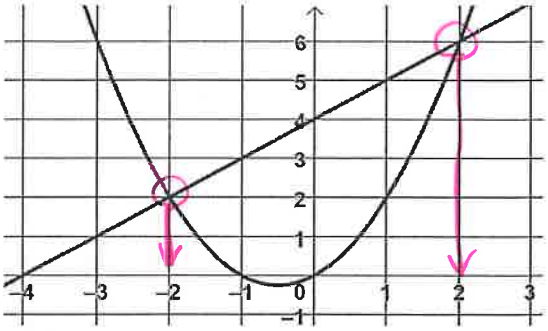
A 2

B 0

C 6

D −2

E −1



2
3
4
5

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 $f(d) = a$

a is a solution, which means it's an x-value. We plug x's in!

4
5

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?

intersections!

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 were $f(x) > g(x)$.

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 $f(x) = g(x)$?

Intersections! Which x-value has matching y-values for f(x) & g(x)?

A 3

B 10

C 17

D Not enough information

2 3 4 5

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 $-1.5 < x < 1.5$ ← −0.41 and 2.4

D $3 < x < 5$

Graph in calculator

4

6. Simplify $\frac{x^2+2x-24}{3x+18}$. $(x+6)(x-4)$ / $3(x+6)$

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

Factor & cancel!

2 3 4 5

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.**

Plug in 5 get 32 out and/or which are equiv. to each other?

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 $f(n) = 4(2)^{n-2}$

1.) look at the signs: last terms multiply to get $-3b^4$, so signs must be diff.

2.) of B & C, which would make $-5a^2b^2$?

2 3

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** $(2a^2 + b^2)(a^2 + 3b^2)$

2 3 4 5

$3^{4x+16} \leftarrow 9^{2x+8} \rightarrow 3^{10x}$

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

A $9^{x+6} = 9^{5x}$ **C** $9^{2x+8} = 9^{5x}$ **E** $9^{x+4} = 9^{5x}$

B $3^{4x+4} = 3^{10x}$ **D** $3^{4x+16} = 3^{10x}$

Change bases & use power-to-a-power

4

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

Synthetic or plug in (-2)

$$\begin{array}{r|rrrr} & 1 & 5 & -9 & -7 \\ -2 & \downarrow & -2 & -6 & 30 \\ \hline & 1 & 3 & -15 & 23 \end{array}$$

2 3 5

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

$h(3) = 2$

A $h(2) = 3$ **B** $h(3) = 2$ **C** $h(-3) = -2$

D $h(2) = -3$ **E** $h(-2) = 3$

Zero number is 3

never change the sign on remainders!

2

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

$f(6) = 5(6)^2 - 36$

$= 180 - 36$

$= 144$

Same as #10

$(x-h)^2+(y-k)^2=r^2$ square the radius

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

A $(x-3)^2+(y+4)^2=7$ **D** $x^2+y^2=7$

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

C $(x-3)^2+(y+4)^2=49$

Change sign for center

4 **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

$r^2=9$

$r=3$

$d=6$

remember, these equations $=r^2$

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

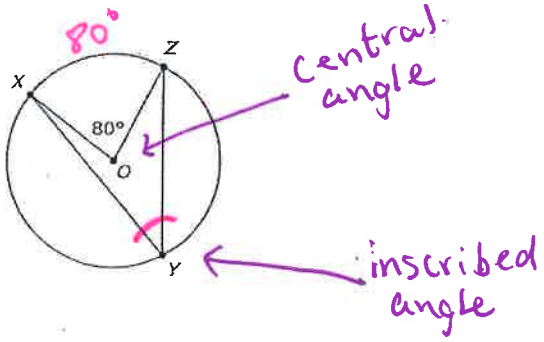
4 **A** 40°

B 60°

C 80°

D 160°

E. There is not enough information



arc = central angle

$\frac{1}{2}$ arc = inscribed angle

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

3 4 5 **A** 9 **B** 10 **C** 11 **D** 12 **E** 8

$A=63.62=\pi r^2$

$\frac{63.62}{\pi}=\frac{\pi r^2}{\pi}$

$r^2=20.25$

$r=4.5$

$d=9$

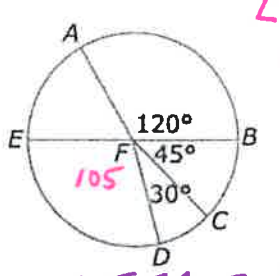
$A_{sector} = \pi r^2 \left(\frac{\theta}{360}\right)$

2 3 5

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



$\angle EFC = 180 - 45 - 30$

$= 105$

$A = \pi r^2 \left(\frac{\theta}{360}\right)$

$= \pi (3)^2 \left(\frac{135}{360}\right)$

$\approx$ ~~10.6~~ ≈ 10.6

$\angle EFC = 135°$

3 4 5

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** $x = -3, 0, 2$

	1	2	-5	-6	0
2	↓	2	8	6	0
	1	4	3	0	0

$x^3 + 4x^2 + 3x$

$x(x^2 + 4x + 3)$

$x(x+3)(x+1)$

$x = 2, 0, -3, -1$

What's the degree? 4

So, how many zeros? 4

Eliminate A & E. $x = 2$ is a zero. Eliminate B.

-3 or 3?

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

$x(x^3 + 3x^2 - 4x - 12)$

$x(x^2(x+3) - 4)(x+3)$

$x(x^2 - 4)(x+3)$

$x(x+2)(x-2)(x+3)$

$x = 0, -3, -2, 2$

Can factor → or graph & find x-intercepts

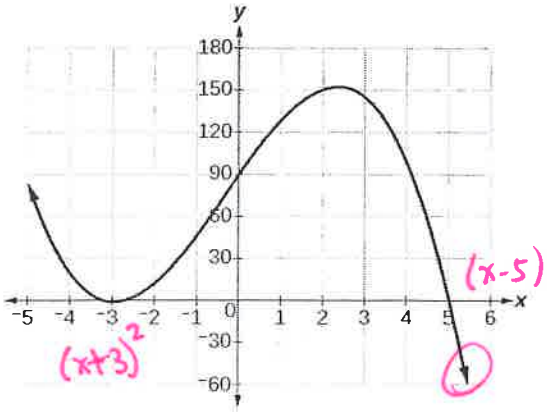
20. Which function could accurately represent the graph below of $f(x)$?

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



neg. lead coeff.

2

4

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** $1.25\ln(0.027)$

$\ln 1.25 = \ln e^{0.027t}$

$\frac{\ln 1.25}{0.027} = \frac{0.027t}{0.027}$

2

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

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

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

$\ln e^{x-3} = \ln\left(\frac{-7}{4}\right)$

impossible

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** $y = -\frac{4}{3}x + 4$

$3y = -4x + 12$

$y = \frac{-4}{3}x + 4$

perp. $m = \frac{3}{4}$

perp. slopes are opposite reciprocal

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** $y = -0.5x + 6$ ✓

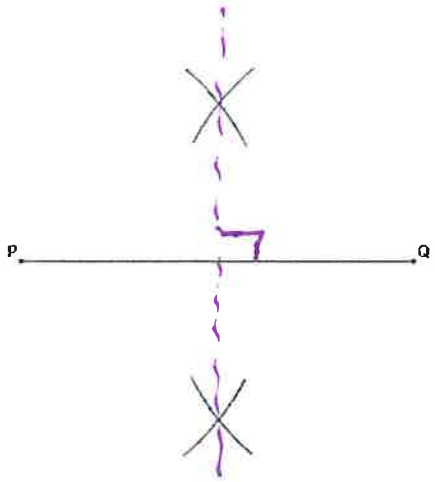
B $y = \frac{x+7}{-2}$ ✓ **D** $y = -2x + 7$

So which slope is not $-\frac{1}{2}$?

Remember, draw lines thru x's in Constructions...

5

25. What is being constructed to the right?



A Angle Bisector

B Parallel Line

C Perpendicular Bisector

D Parallelogram

$V = \pi r^2 h \rightarrow Can = \pi 5^2(4) = 314.16$

Indiv. Sausage $= \pi(1.5)^2(3.85) = 27.21$ ✓

2
3

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?

x 10
272.1

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

314.16
−272.1
42.02

3
4
5

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 → there'd be a flat line = same # of dead fish every year

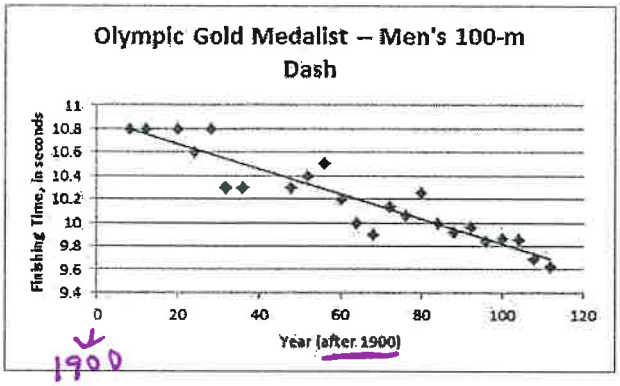
B 91.4, number of fish deaths per year when the pollution index is 0

C 91.4, number of years

D 8.7, number of fish deaths that occur with an increase of 1 in the pollution index

4

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. no - 1900

C It can be assumed that by year 2040, the finishing time will reach 0. lol

D Every 10 years the running distance decreased by 3 meters. ?! always a 100m race!

100 m in zero seconds...

3
4

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 $0.300 \leq \frac{11x}{53x}$

B $0.300 \leq \frac{11}{53}$

C $0.300 \leq \frac{11+x}{53}$

D $0.300 \leq \frac{11+x}{53+x}$

$0.3 \leq \frac{11+x}{53+x}$

$0.3(53+x) \leq 11+x$

Work for #30

$15.9 + 0.3x \leq 11 + x$

$-11 \quad -0.3x \quad -11 \quad -0.3x$

$\frac{4.9}{0.7} \leq \frac{0.7x}{0.7}$

$7 \leq x$

$x \geq 7$

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

3
4

A 3 **B** 4 **C** 7 **D** 9 **E** 11

Work w/ #29

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?

Sum!

A \$10,184 **C** \$237,506 **E** \$254,567

B \$245,184 **D** \$261,345

$D(t) = 47{,}000(1+0.04)^t$

$t=0 \to$ 47,000
$t=1 \to$ +48,880
$t=2 \to$ +50,835.2
$t=3 \to$ +52,868.61
$t=4 \to$ +54,983.35

Yuck...

3

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

$4x^2(3x+5) \to 4(3x^3+5x^2)$

$4(3x-1)$

$(4)(x-1)$

A $x^2+\frac{4}{3}x-\frac{4}{9}+\frac{4}{27x-9}$

B $x^2+2x+\frac{2}{3}+\frac{2}{9x-3}$

C $x^2+\frac{4}{3}x+\frac{4}{9}+\frac{4}{27x-9}$

D $x^2+2x-\frac{2}{3}+\frac{-2}{9x-3}$

E $x^2-\frac{4}{3}x-\frac{4}{9}+\frac{4}{27x-9}$

	3	5	0	0
$\frac{1}{3}$	↓	1	2	$2\frac{2}{3}$
	3	6	2	$\frac{2}{3}$

$\frac{1}{3}\left(3x^2+6x+2+\frac{\frac{2}{3}}{3x-1}\right)$

$x^2+2x+\frac{2}{3}+\frac{2}{9x-3}$

$\frac{\frac{2}{3}\cdot\frac{3}{1}}{3x-1}\cdot\frac{\frac{2}{3}}{1}$

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

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

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

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

Place a check mark in the appropriate box within the table that describes the end behavior of each function as $x \to \infty$. 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

$x \to \infty$ & incr.
up & to right

$x \to \infty$ & decr.
down & to right

$\frac{8}{3}\cdot\frac{1}{12x-4} = \frac{8}{36x-12} = \frac{2}{9x-3}$

$x^2+2x+\frac{2}{3}+\frac{\frac{8}{3}}{12x-4}$

$12x-4 \;|\; 12x^3+20x^2+0x+0$

$-(12x^3-4x^2)$

$24x^2+0x$

$-(24x^2-8x)$

$8x+0$

$-(8x+\frac{-8}{3})$

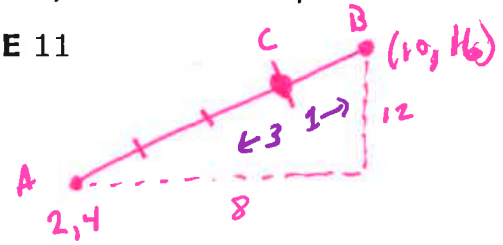
$\frac{8}{3}$

C is $\frac{3}{4}$ the way to A and $\frac{1}{4}$ the way to B

34. Point C lines 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

$y \to 4 + \frac{3}{4}(12) = 13$



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 $f(t) = 28{,}500\left(1.073^{\frac{1}{12}}\right)^{t}$ **C** $f(t) = 28{,}500\left(1.073^{\frac{1}{12}}\right)^{12t}$

B $f(t) = 28{,}500\left(0.927^{\frac{1}{12}}\right)^{12t}$ **D** $f(t) = 28{,}500\left(0.927^{\frac{1}{12}}\right)^{t}$

$f(t) = 28{,}500(1-0.073)^{t}$

$= 28{,}500(0.927)^{t}$

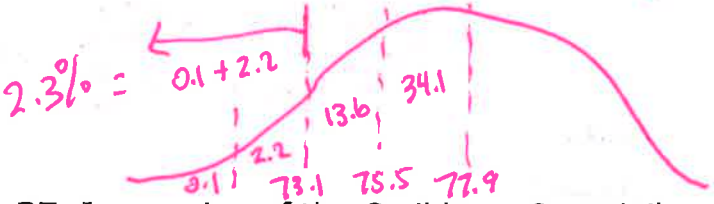
So, $\to 28{,}500\left(0.927^{\frac{1}{12}}\right)^{12t}$

$\frac{1}{12} \cdot 12 = 1$

Depreciates, so $b < 1$. Eliminate A & C.
In the end, exponent must have coefficient of 1, likely yearly expression.

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%

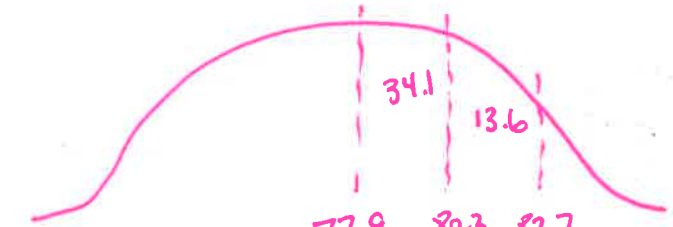


Which columns under the curve include less than 73.1?

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%

include less than 82.7?

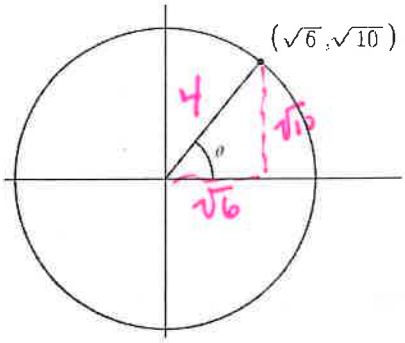


50 + 34.1 + 13.6

97.7%

The radius of this circle $\neq 1$, so you have to find that length. Pyth. Thm.

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



1.) $\sqrt{6}^2 + \sqrt{10}^2 = h^2$

$16 = h^2$

$4 = h$

2.) $\sin\theta = \frac{O}{H} = \frac{\sqrt{10}}{4}$

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

$S = r\theta$

$24 = 4\theta$

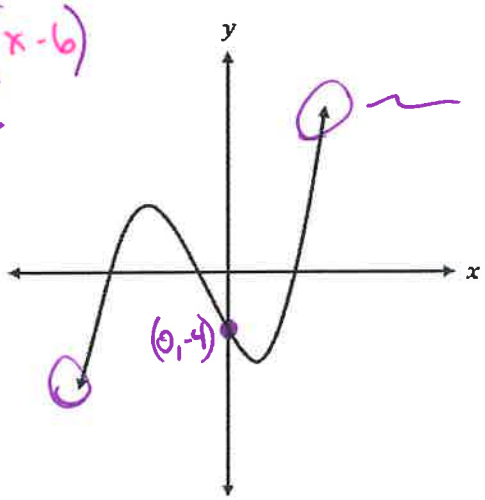
$\theta = 6$

arc length, S, equals $r\theta$ when θ is in radians

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).

$(x+8)$ $(x+3)$ $(x-6)$

three factors



Degree is odd

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 $(x-6)(x+3)(x+4)(x+8)$.

Exponential functions have horizontal asymptotes at whatever value is added or subtracted last. For this problem +4, so $y = 4$

decay ↓ — H.A. @ $y = 4$

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

0.2 is less than 1, so decay!

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 $y = 4$.

Calc! STAT! Regression!

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	3	4	6
Coins Returned	1,000	610	220	132	45

$y = 1018.2839(0.59686)^x$ ← 10

$= 6$

A 16 **B** 6 **C** 4 **D** 2 **E** 1

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

$y = 27.03477(1.15445)^x$

$= 27.03477(1.15445)^{24}$

$= 849\ldots$

Pop. dens. = pop. / land area

A pop dens. → 3,002,859 / 28,748 = 104.45 ppl/km²

B → 45,239,079 / 1,138,910 = 39.72 ppl/km²

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?

Look at units of answers! g/cm³

V = 8·5·4 = 160 cm³

A 0.3 g/cm³

B 3.0 g/cm³

C 7.9 g/cm³

D 16.0 g/cm³

480 g / 160 cm³ = 3 g/cm³

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

already isolated

A $3h = \frac{41}{9}$

B $9^h = \frac{41}{3}$

C $log_9(41) = 3h$

D $log_9(3h) = 41$

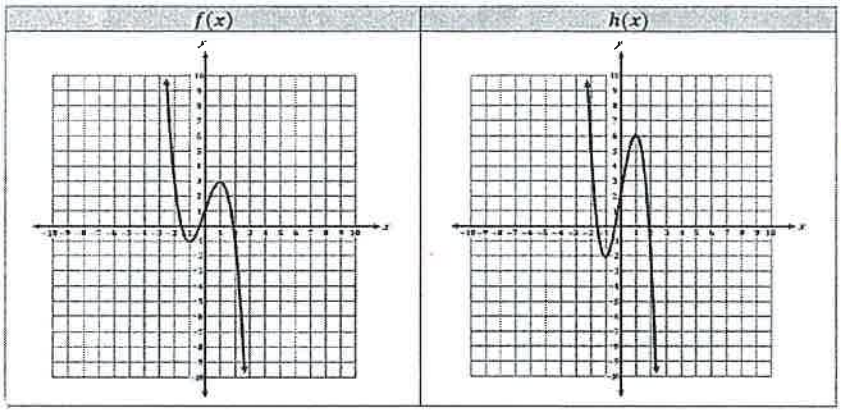
$\log 9^{3h} = \log 41$

but they did a rewrite

base is 9!

$\log_9 41 = 3h$

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



looks like vert. stretch

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

A $h(x) = f(x) = 3$? this is not a transformation

B $h(x) = f(x + 3)$ no left/right

C $h(x) = f(2x)$ hori. compression – no

D $h(x) = 2f(x)$ vert. stretch

Graph them! If you can't tell by equations.

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

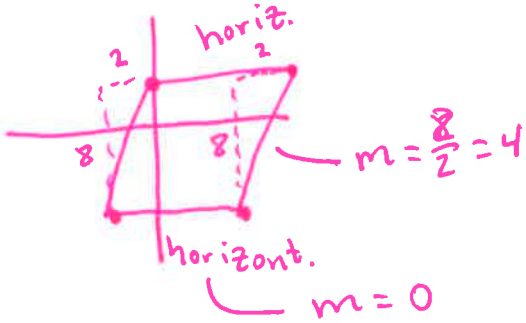
A a parallelogram that is not a rhombus

B a rectangle that is not a square no 90° angles

C a rhombus that is not a square sides not congruent

D a trapezoid that is not a parallelogram

2 pair // sides



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

$a^3 - b^3 = (a-b)(a^2+ab+b^2)$

$= (51-34)(\quad . \quad . \quad .)$

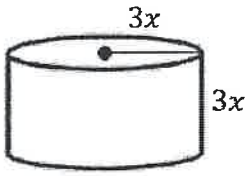
A $(51 - 34)(51 + 34)$

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.



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

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

B $x = \sqrt[2]{\frac{27\pi}{V}}$

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

D $x = \sqrt[2]{\frac{V}{27\pi}}$

$\frac{V}{27\pi} = \frac{27x^3\pi}{27\pi}$

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

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