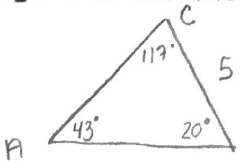
Precalculus. REVIEW FOR STATE FINAL EXAM. Fall 2018 Name: Key

1. Given a triangle with a = 5, A = 43°, and B = 20°, what is the length of c? Round to the nearest tenth.

A. 2 B. 8 C. 5.2 D. 6.5

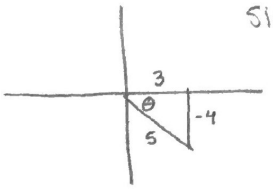


$\frac{\sin 43}{5} = \frac{\sin 117}{c}$

$c = 6.5$

2. Find sin(Θ) if Θ is an angle in standard position and the point with coordinates (3, -4) lies on the terminal side of the angle.

A. -4/5 B. -5/4 C. 3/5 D. -4/3



$\sin\theta = -\frac{4}{5}$

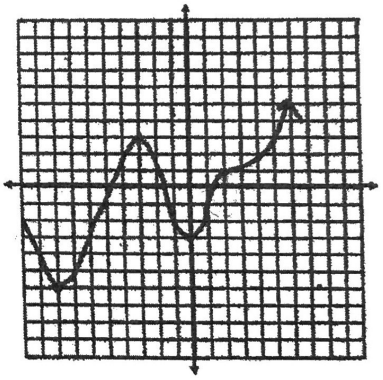
3. Solve the equation if $0° \le \Theta \le 360°$. $\cos(x) = -\frac{1}{2}$

$2\pi/3, 4\pi/3$

$120°, 240°$

A. 150°, 210° B. 135°, 225° C. 210°, 330° D. 120°, 240°

4. Determine the critical points for the following function.



A. (0, -3) absolute minimum; (8, -6) relative minimum
(-3, 3) absolute maximum ; (2, 1) relative maximum

B. (0, -3) point of inflection; (-3, 3) relative maximum
(-8, -6) absolute minimum; (2, 1) relative maximum

C. (-3, 3) absolute maximum; (0, 3) relative minimum
(8, -6) absolute minimum; (2, 1) point of inflection

D. (-8, -6) absolute minimum; (0, -3) relative minimum;
(-3, 3) relative maximum; (2, 1) point of inflection

5. Change -120° to radian measure in terms of π.

A. (-4/3) π B. –π C. (-2/3) π D. (-1/3) π

$-120 \cdot \frac{\pi}{180}$

$-\frac{2\pi}{3}$

$a = \frac{7.3+2.5}{2} = 4.9$

6. Barnacles on a wharf are 2.5 feet out of the water at low tide and 7.3 feet below water at high tide. Write a sine function that models the water level relative to the barnacles, if the period from high tide high tide is 12.5 hours and the phase shift for high tide is 2.85 hours.

A. $y = 9.8\sin\left(\frac{t}{6.25}\pi + \frac{2.85}{6.25}\pi\right) - 2.4$

B. $y = 9.8\sin\left(\frac{t}{6.25}\pi - \frac{2.85}{6.25}\pi\right) + 2.4$

C. $y = 4.9\sin\left(\frac{t}{6.25}\pi + \frac{1.425}{6.25}\pi\right) + 2.4$

D. $y = 4.9\sin\left(\frac{t}{6.25}\pi - \frac{2.85}{6.25}\pi\right) - 2.4$

period: $\frac{2\pi}{B}$

$12.5 = \frac{2\pi}{B}$

$B = \frac{2\pi}{12.5} = \frac{\pi}{6.25}$

midline: $\frac{7.3-2.5}{2} = 2.4$

7. Write an equation of the cosine function with the given amplitude, period, phase shift, and vertical shift
Amplitude = 4, period = $(2/3)\pi$, phase shift = $(2/9)\pi$, vertical shift = 3

A. $y = \pm 4\cos\left(3\theta - \frac{2}{3}\pi\right) + 3$

B. $y = \pm 4\cos\left(3\theta - \frac{3}{2}\pi\right) + 3$

C. $y = \pm 4\cos\left(\frac{1}{3}\theta - \frac{3}{2}\pi\right) - 3$

D. $y = \pm 4\cos\left(\frac{1}{3}\theta - \frac{2}{3}\pi\right) - 3$

period: $\frac{2\pi}{B}$

$\frac{2\pi}{3} = \frac{2\pi}{B}$

$B = 3$

p.c: $-\frac{C}{B}$

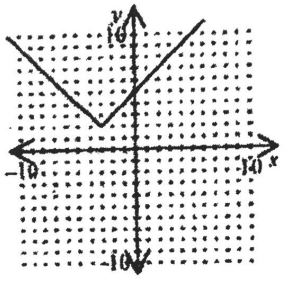
$\frac{2\pi}{9} = -\frac{C}{3}$

$\frac{6\pi}{-9} = \frac{-9C}{-9}$

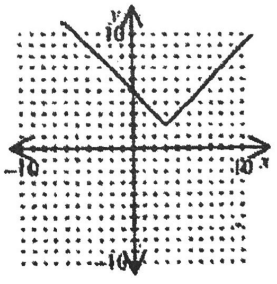
$\frac{2\pi}{3} = C$

8. Find the rule and the graph of the function whose graph can be obtained by performing the translation 3 units left and 2 units up on the parent function f(x) = |x|

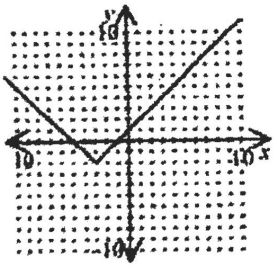
[A] $f(x) = |x+3|+2$



[B] $f(x) = |x-3|+2$



[C] $f(x) = |x+3|-2$



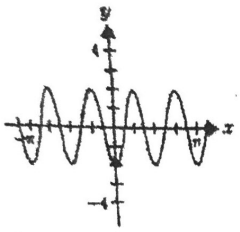
[D] none of these

9. Which of the following is the graph of $f(x) = 4\cos(2x - \pi)$?

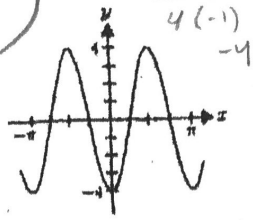
period $= \frac{2\pi}{2}$

per $= \pi$

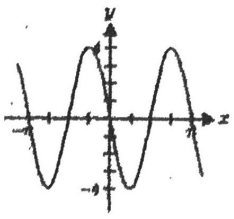
a)



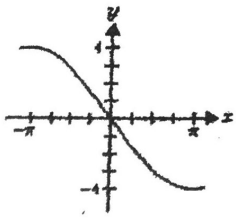
b) $4\cos(2\cdot 0 - \pi)$ $4\cos(-\pi)$ $4(-1)$ -4



c)



d)



10. Solve $2\cos^2 x - \cos(x) - 1 = 0$ for principal values of x. $(0, 180°)$

$(2\cos x + 1)(\cos x - 1) = 0$

$\cos x = -\frac{1}{2}$ $\cos x = 1$

$x = \frac{2\pi}{3}, \frac{4\pi}{3}$ $x = 0$

A. $0°$ and $120°$ B. $30°$ C. $60°$ D. $0°$ and $60°$

11. Find the inverse of the function. $f(x) = \frac{3x+8}{4}$

$y = \frac{3x+8}{4}$

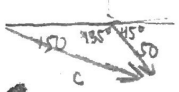
$x = \frac{3y+8}{4}$

$4x = 3y + 8$

$4x - 8 = 3y$

A. $g(x) = \frac{4x+8}{3}$ B. $g(x) = \frac{4x-8}{3}$ C. $g(x) = 3x - 4$ D. $g(x) = \frac{4}{3x+8}$

12. Without wind a plane would fly due east at a rate of 150 mph. The wind is blowing southeast at a rate of 50 mph. The wind is blowing at a 45° angle from due east. What is the actual speed of the plane with the wind?



$c^2 = 150^2 + 50^2 - 2(150)(50)\cos(135)$

$c = 188.69$

A. 188.7 mph B. 158.1 mph C. 120.0 mph D. 150.0 mph

13. A discus is thrown from a height of 3 feet with an initial velocity of 55ft/s at an angle of 44° with the horizontal. Write parametric equations to represent the path of the discus.

A. $x = 55t\cos 46°, y = 55t\sin 46° - 16t^2 + 3$
B. $x = 55t\cos 44°, y = 55t\sin 44° - 16t^2 + 3$
C. $x = 55t\cos 46°, y = 55t\sin 46° - 4.9t^2 + 3$
D. $x = 55t\cos 44°, y = 55t\sin 44° - 4.9t^2 + 3$

real and imaginary

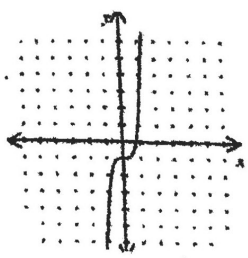
14. Determine the number of zeros of the polynomial function $f(x) = -3x^2 - 3x + 2x^3 - 3$.

A. 3 B. 4 C. 1 D. 2

15. Use your knowledge of polynomial function to match one of the functions to the graph below.

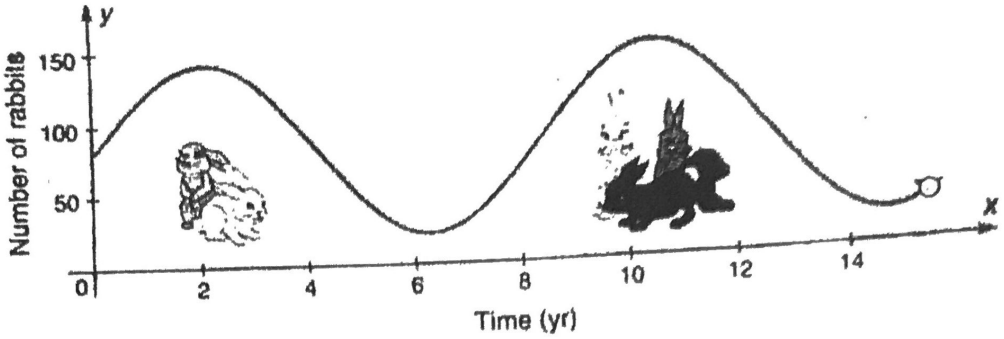
A. $f(x) = 2x^5 + x^3 - 1$ B. $f(x) = -2x^4 + x^2 - 1$

C. $f(x) = -2x^5 + x^2 + x$ D. $f(x) = 2x^4 - x^2 + 1$



- odd degree
- + leading coeff.

16. Choose the answer that bests represents domain and range.



A. D: [0, 16) R: [25, 150]

B. D: [0, 16] R: [25, 200)

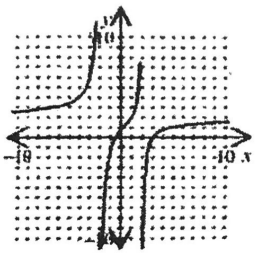
C. D: [0, ∞] R: [0, 150)

D. D: (0, 16) R: (50, 150)

17. Which graph shows the graph and lists the asymptotes of the rational function $f(x) = \frac{3x^2 - 2x - 1}{x^2 - x - 6}$

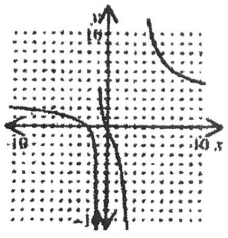
$x \neq 3, -2$

[A]



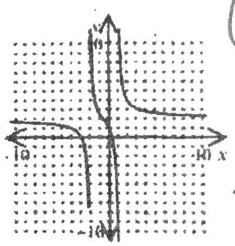
x= -2, x = 2, y = 2

[B]



x = -1, x = 3, y = 3

[C]



x = -2, x = 1, y = 2

[D]

x = -2, x = 3, y = 2

18. Which graph is correct, including all x-intercepts, holes, and asymptotes of the function $y = \frac{x^2 - x}{(x+2)(x-3)(x-1)}$?

$\frac{x(x-1)}{(x+2)(x-3)(x-1)}$

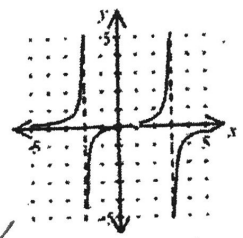
zeroes: $x = 0$

holes: $x = 1$

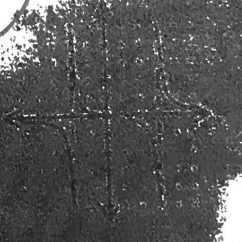
VA: $x = -2, x = 3$

$x = 1$: $\frac{1}{(1+2)(1-3)} = \frac{1}{(3)(-2)} = -\frac{1}{6}$

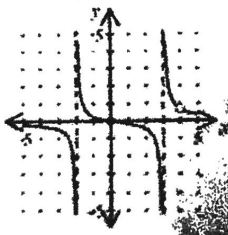
[A]



[B]



[C]



19. Find all the complex zeros of the polynomial function $f(x) = x^4 + 6x^3 + 6x^2 - 24x - 40$

A. 2, -2, -3 – i, -3 + i B. 3, -3, 2 –i, 2 + i

C. 2, -2, -3 – 2i, -3 + 2i D. none of these

real zeroes (from graphing): $x = -2, x = 2$

$$\begin{array}{c|ccccc} 2 & 1 & 6 & 6 & -24 & -40 \\ & \downarrow & 2 & 16 & 44 & 40 \\ \hline & 1 & 8 & 22 & 20 & 0 \end{array}$$

$x^3 + 8x^2 + 22x + 20$

$$\begin{array}{c|ccccc} -2 & 1 & 8 & 22 & 20 \\ & \downarrow & -2 & -12 & -20 \\ \hline & 1 & 6 & 10 & 0 \end{array}$$

$x^2 + 6x + 10$

$\frac{-6 \pm \sqrt{36 - 4(1)(10)}}{2(1)}$

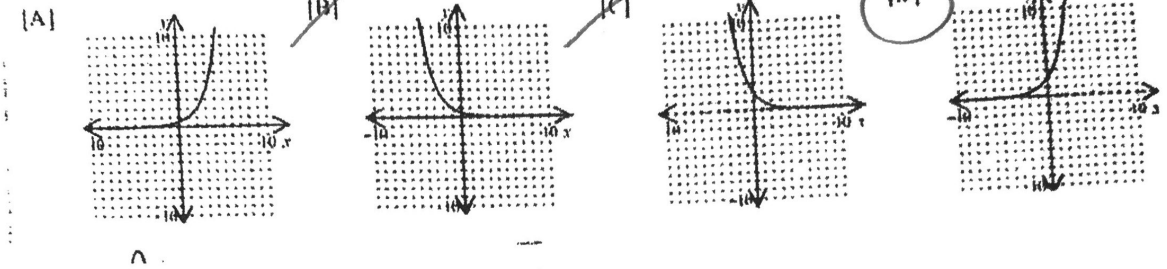
$\frac{-6 \pm \sqrt{-4}}{2}$

$\frac{-6 \pm 2i}{2}$

$-3 \pm i$

20. Which is the graph of the function $f(x) = 2^{1+x}$?

[A] [B] [C] [D]



21. If $4000 is invested at an interest rate of 8% compounded continuously, determine the balance in the account after 3 years.

$4000e^{0.08 \cdot 3}$

A. $5085.00 B. $5038.85 C. $29,556.22 D. $5508.51

22. Write an exponential function to model this situation. Then predict the value of the function after 5 years (to the nearest whole number). A population of 200 animals that decreases at an annual rate of 15%

A. $f(x) = 200(0.85)^x$; 89 B. $f(x) = 200(0.85)^x$; 850

C. $f(x) = 200(1.15)^x$; 1150 D. $f(x) = 200(1.15)^x$; 402

$200(1 - 0.15)^5$

23. Find the value of **ln (51)**

A. 1.707 B. 3.932 C. 1.708 D. 3.933

24. Find the exact value of $\ln\sqrt{e}$.

$\ln e^{1/2} = \frac{1}{2}$

A. 2 B. $\frac{1}{2e}$ C. 2e D. $\frac{1}{2}$

25. Solve for x. $10^x = 27$

A. x = 2.7 B. x = 1.43 C. x = 0.99 D. x = 2.30

$\log_{10} 27 = x$

$1.43 = x$

$\log x^5 - \log (x-6)^2$

$\log \frac{x^5}{(x-6)^2}$

26. Which is $5\log x - 2\log(x-6)$ written as a single logarithm?

A. $\log \frac{x^5}{(x-6)^2}$ B. $10\log \frac{x}{x-6}$ C. $\log x^5(x-6)^2$ D. none of these

27. The number of bacteria present in a culture after t minutes is given as $B = 100e^{kt}$, where k is a constant. IF there are 3410 bacteria present after 11 minutes, find k.

A. 3.529 B. 0.321 C. 38.822 D. 0.353

$\frac{3410}{100} = \frac{100e^{k\cdot 11}}{100}$

$34.10 = e^{11k}$

$11k = \ln 34.10$

$k = \frac{\ln 34.10}{11}$

28. The half-life of a radioactive element is 134 days, but your sample will not be useful to you after 70% of the radioactive nuclei originally present have disintegrated. Use the half-life function $M(x) = c(0.5)^{\frac{x}{h}}$, about how many days can you use the sample?

30% remaining

A. 228 B. 248 C. 233 D. 223

$0.3 = 0.5^{x/134}$

$\log_{0.5} 0.3 = \frac{x}{134}$

$134 \log_{0.5} 0.3 = x$

29. Give the angle measure represented by 1.75 rotations counterclockwise.

A. -630° B. -90° C. 90° D. 630°

$1.75 \times 360° = 630°$

30. Identify the ordered pair that represents the vector from A(8, -7) to B(-3, 2) and the magnitude of $\vec{AB}$.

A. $\langle 5,-5\rangle, \sqrt{10} \approx 3.1623$

B. $\langle 11,-9\rangle, \sqrt{101} \approx 10.0499$

C. $\langle -11,9\rangle, 2\sqrt{5} \approx 4.4721$

D. $\langle -11,9\rangle, \sqrt{202} \approx 14.2127$

$\langle -3-8, 2-7\rangle$

$\langle -11, 9\rangle$

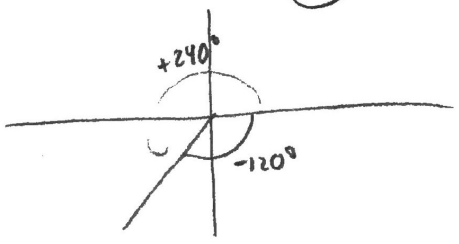
$\sqrt{(-3-8)^2 + (2-7)^2}$

$\sqrt{121 + 81}$

$\sqrt{202}$

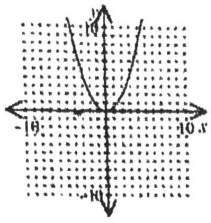
31. Identify the co-terminal angle between -360° and 360° for the angle -120°.

A. -240° B. 60° C. 240° D. 300°

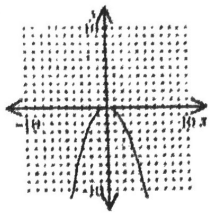


32. Which is the graph of $y = -\frac{1}{2}x^2$?

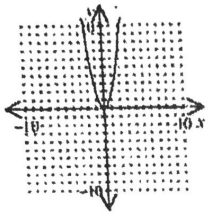
[A]



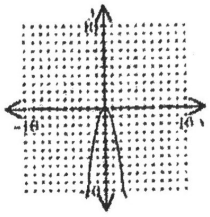
[B]



[C]



[D]



33. Determine whether the sequence is arithmetic, geometric, or neither.

-3, -21, -147, -1029, -7203, ...

A. arithmetic B. geometric C. neither D. logarithmic

34. Find the common ratio for the geometric sequence $5\left(\frac{1}{2}\right)^{n-1}$.

A. $\frac{1}{2}$ B. 10 C. 5 D. $\frac{5}{2}$

35. Select the correct description of the sequence: {12, 6, 0, -6, -12, -18, ...}

A. Arithmetic with d = 6 B. Arithmetic with d = 12

C. Arithmetic with d = -6 D. Not arithmetic

36. Find the nth partial sum of the arithmetic sequence $\{a_n\}$ with a common difference d. n = 12, a_1 = -3, d = -8.

A. 752 B. -1128 C. -564 D. none of these

37. A frog is trying to cross a road. Each time the frog jumps it leaps half of its previous distance. On its first jump it makes a leap of 16 ft, on the second jump it makes 8ft, on the third jump 4ft, and so on. If the pattern continues will the frog ever cross a road that is 32 ft wide?

A. YES B. NO C. not possible to determine

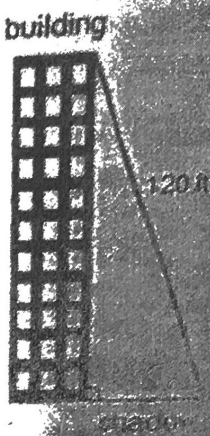
$2(3)^{1-1} = 2$ $\quad S_{15} = \frac{2(1-3^{15})}{1-3} =$

38. Evaluate the following expression: $\sum_{k=1}^{15} 2(3)^{k-1}$

A. 4,782,968 B. 345 C. 9,565,938 D. 14,348,906

Use the diagram at right to answer questions 39 and 40.

The angle of elevation from the end of the shadow to the top of the building is 56°.



39. Find the height of the building to the nearest foot. $\sin 56 = \frac{x}{120}$ $x = 99.48$

A. 99ft B. 67ft C. 178 ft D. 81ft

40. Find the length of the shadow to the nearest foot.

A. 99ft B. 67ft C. 178 ft D. 81 ft

$\cos 56 = \frac{y}{120}$ $y = 67.1$

41. Find the rectangular coordinates of $(7, 300°)$ (r, θ)

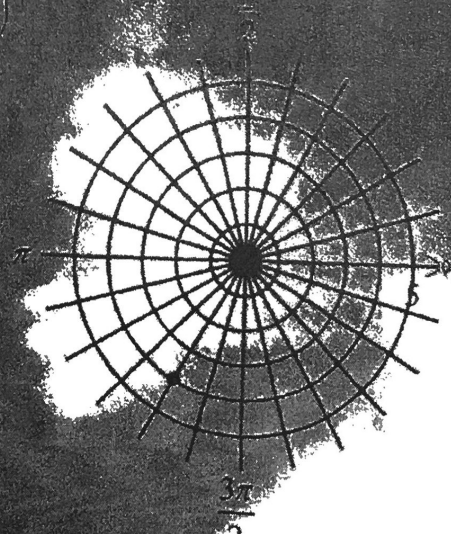
$x = r\cos\theta = 7\cos 300 = 3.5$

A. $\left(\frac{-7\sqrt{2}}{2}, \frac{-7\sqrt{2}}{2}\right)$ B. $\left(\frac{7}{2}, \frac{-7\sqrt{3}}{2}\right)$

$y = r\sin\theta = 7\sin 300 = -6.06$

C. $\left(-\frac{7}{2}, -\frac{7\sqrt{3}}{2}\right)$ D. $\left(\frac{7\sqrt{2}}{2}, \frac{-7\sqrt{2}}{2}\right)$

42. Name the polar coordinates of the point graphed to the side.



A. $(5, \frac{11\pi}{6})$ B. $\left(4, \frac{\pi}{3}\right)$

C. $\left(4, \frac{4\pi}{3}\right)$ D. $\left(5, \frac{7\pi}{6}\right)$