Pre-Calculus 12 Practice Exam C

Multiple-Choice: Part 1 Calculator Not Permitted

1. Determine the period of $y = 3\sin\pi(x-4)+5$.

A. 2
B. 3
C. 4
D. 5

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

$\frac{2\cancel{\pi}}{\cancel{\pi}} = P$

$2 = P$

2. A pendulum 20 cm long swings through an arc of length 15π cm. Through what angle, in degrees, does the pendulum swing?

A. 45°
B. 120°
C. 135°
D. 270°

$S = r\theta$

$r = 20$

$S = 15\pi$

$\theta = ?$

$\frac{S}{R} = \theta$

$\frac{15\pi}{20} = \theta$

135°

$2.35 \text{ rads} \times \frac{180°}{\pi \text{ rads}}$

3. Determine the exact value of $\cot\left(-\frac{5\pi}{6}\right)$.

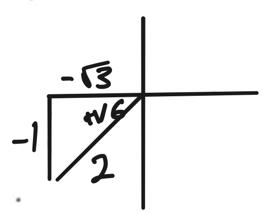
A. $-\sqrt{3}$
B. $-\frac{1}{\sqrt{3}}$
C. $\frac{1}{\sqrt{3}}$
D. $\sqrt{3}$

→ draw angle

→ Find ref. angle

→ apply △'s

$\frac{5\pi}{6}$



$\frac{-1}{-\sqrt{3}} = \frac{1}{\sqrt{3}}$ $\sqrt{3}$

4. Determine the range of the function $y = -5\boxed{\sin 2x} - 3$.

$-1 \leq \sin(2x) \leq 1$

A. $-8 \leq y \leq 2$
B. $-8 \leq y \leq -2$
C. $-5 \leq y \leq 5$
D. $-2 \leq y \leq 8$

$-5 + (-3) = -8$

$(-5)(1) - 3 = -8$

$(-5)(-1) - 3 = 2$

$\cos(A+B) = \cos A\cos B - \sin A \sin B$

$-\cos(A+B) = -\cos A \cos B + \sin A \sin B$

5. Which expression is equivalent to $\sin 3x \sin 2x - \cos 3x \cos 2x$?

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

$-\cos(5x)$

A. $\cos x$
B. $-\cos x$
C. $\cos 5x$
D. $-\cos 5x$

$-[\cos(3x)\cos(2x) - \sin(3x)\sin(2x)]$

$-[\cos(3x+2x)] = -\cos(5x)$

6. Which expression is equivalent to $\cos^4 x - \sin^4 x$?

$u^4 - m^4$

$(u^2)^2 - (m^2)^2$

$(u^2 - m^2)(u^2 + m^2)$

$\cos x = u$

$\sin x = m^4$

$a^2 - b^2$

$a = u^2 \quad b = m^2$

A. $\cos 2x$
B. $\cos 4x$
C. $\cos^2 2x$
D. $\cos^2 4x$

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

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

$a^4 - b^4 = (a^2 - b^2)(a^2 + b^2)$

$(\cos^2 x - \sin^2 x)\underbrace{(\cos^2 x + \sin^2 x)}_{=1}$

$(\cos^2 x - \sin^2 x)$

$= \cos 2x$

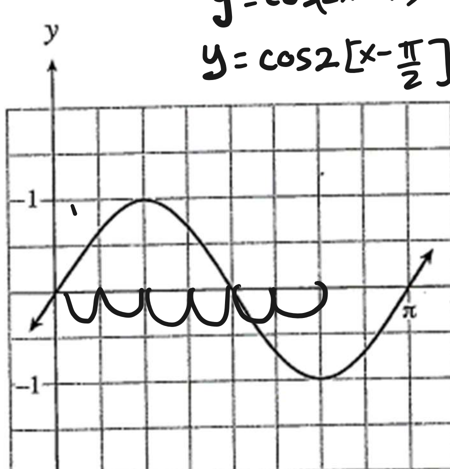
$\boxed{(\cos 2x)(1) = \cos 2x}$

7. Which of the following is the graph of $y = \cos(2x - \pi)$?

$y = \cos(2x - \pi)$

$y = \cos 2[x - \frac{\pi}{2}]$

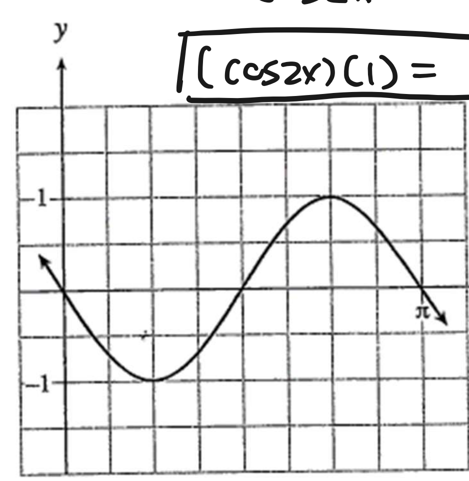
A.



$\frac{\pi}{8}$

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

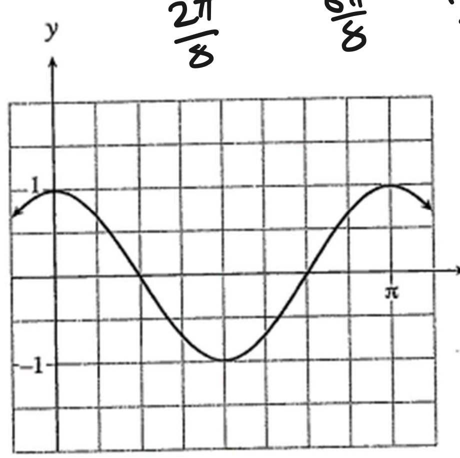
B.

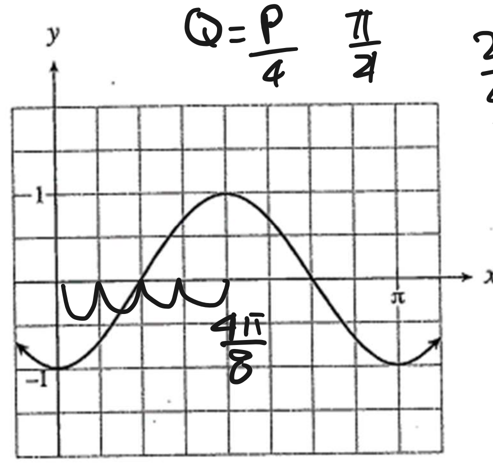


$\frac{2\pi}{8}$ $\quad$ $\frac{6\pi}{8}$ $\quad$ $\frac{2\pi}{8} - \frac{6\pi}{8}$ 0

$Q = \frac{P}{4}$ $\quad$ $\frac{\pi}{4}$ $\quad$ $\frac{2\pi}{4}$

C.





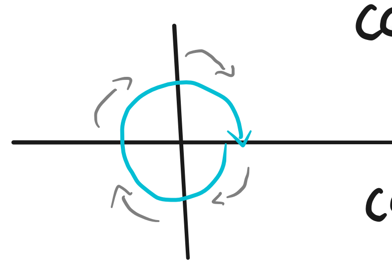
$\frac{4\pi}{8}$

$$\cos^2 x = \cos x$$
$$\cos^2 x - \cos x = 0 \longrightarrow \cos x\,[\cos x - 1] = 0$$
$\cos x = 0$

$\cos x - 1 = 0 \Rightarrow \cos x = 1$

8. Determine the number of solutions for $\cos^2 x = \cos x$, where $-2\pi < x < 2\pi$.

A. 1
B. 3
C. 5
D. 7



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

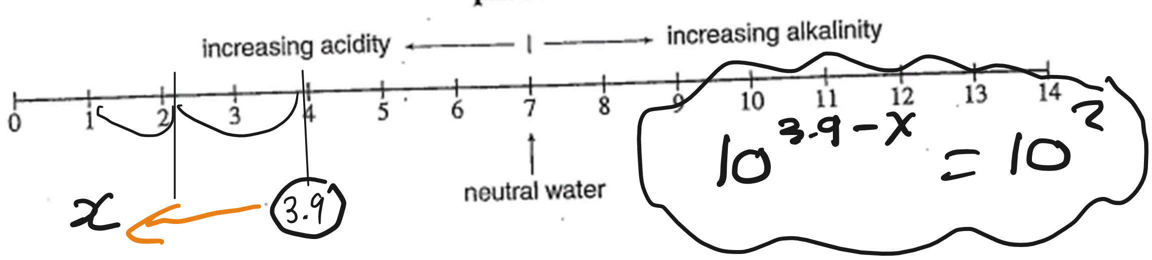
$-\frac{\pi}{2}, -\frac{3\pi}{2}$

$\cos x = 1$ At $0,$

9. In chemistry, the pH scale measures the acidity (0–7) or alkalinity (7–14) of a solution. It is a logarithmic scale in base 10. Thus a pH of 5 is 10 times more acidic than a pH of 6.

$\log_{10} 100 = \boxed{2}$ add or subtract $\quad 3.9 - 2 = 1.9$

pH Scale



$10^{3.9 - x} = 10^2$

In a certain region, acid rain has a pH of 3.9. What is the pH of a solution that is 100 times more acidic than this acid rain?

A. 1.9
B. 3.7
C. 4.1
D. 5.9

$100 = 10^2$

acid rain pH = 3.9

other soln $3.9 - 2 = 1.9$

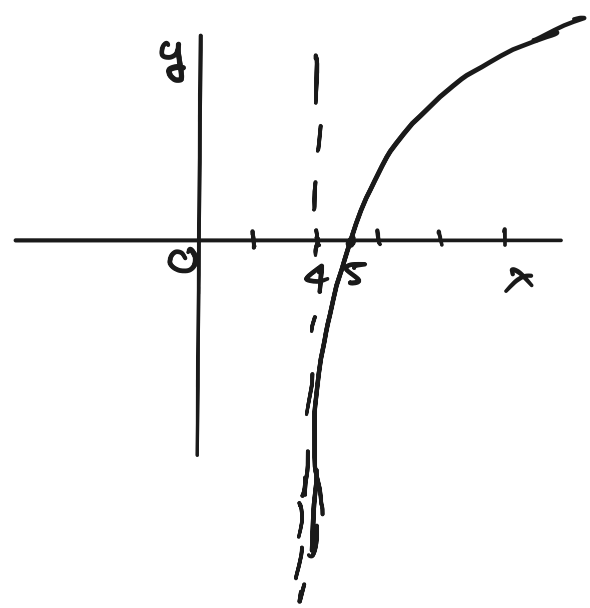
10. Determine the domain of $y = \log\boxed{x-4}$.

A. $x < -4$
B. $x > -4$
C. $x < 4$
D. $x > 4$

$y = \log(x-4)$

$x - 4 > 0$

$\boxed{x > 4}$



<u>domain</u>

$y = -\log(-x+2)$

$y = -\log(-x+2)$

$-x+2>0$

$-x>-2$

$\boxed{x<2}$

11. Evaluate: $\log_3 \frac{1}{27}$

A. -9

B. -3

C. $\frac{1}{3}$

D. $\frac{1}{9}$

$\log_3 \frac{1}{27}$

$\log_3 3^{-3}$

$\cancel{\log_3} 3^{-3}$

-3

12. Solve: $8^{x-1} = \frac{1}{16}$

A. -1

B. $-\frac{1}{3}$

C. 2

D. $\frac{7}{3}$

$8^{x-1} = \frac{1}{16}$

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

$2^{3x-3} = 2^{-4}$

$3x-3=-4$

$3x=-4+3$

$3x=-1$

$\frac{\cancel{3}x}{\cancel{3}} = \frac{-1}{3}$

$\boxed{x = \frac{-1}{3}}$

13. Solve: $\log_{12}(3-x)+\log_{12}(2-x)=1$

A. -3.5

B. -1

C. 6

D. $-1, 6$

$\log_{12}(3-x)+\log_{12}(2-x)=1$

$\log_{12}(3-x)(2-x)=1$

$\to \cancel{\log_{12}} (3-x)(2-x) = 12^1$

$\cancel{12}$

$(3-x)(2-x)=12$

$6-3x-2x+x^2=12$

$x^2-5x+6-12=0$

$x^2-5x-6=0$

$(x-6)(x+1)=0$

$x=6$ = Reject

$x=-1$

$(3-6)$

-3

14. Evaluate: $3^{\log_3 2+\log_3 5}$

A. 3^7

B. 3^{10}

C. 7

D. 10

$3^{\log_3 2+\log_3 5}$

$\cancel{3}^{\cancel{\log_3}(2)(5)}$

10

15. Which equation represents the graph of $y = f(x)$ after it is stretched vertically by a factor of $\frac{1}{5}$, then translated 3 units down.

A. $y=\frac{1}{5}f(x)-3$

B. $y=5f(x)-3$

C. $y=\frac{1}{5}f(x)+3$

D. $y=5f(x)+3$

16. The point $(6,\ 12)$ is on the graph of $y=f(x)$. If this point is transformed to the point $(2,\ 6)$ on the graph of $y=af(bx)$, determine the values of a and b.

A. $a=\frac{1}{3},\ b=2$

B. $a=\frac{1}{3},\ b=\frac{1}{2}$

C. $a=\frac{1}{2},\ b=3$

D. $a=\frac{1}{2},\ b=\frac{1}{3}$

$\boxed{\left(\frac{x}{b}, ay\right)}$

$\frac{6}{b}=2$

$b=3$

$12a=6$

$a=1/2$

a

$y=\frac{1}{2}f[3(x)]$

A=

17. The point $(-2,\ 3)$ is on the graph of $y=f(x)$. Which transformed function will cause this point to lie in quadrant 4?

$y=f(x)$

$y=f(-x)$

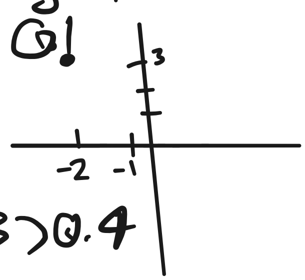
A. $y=f(-x)$ ✗ $(2,3)$ Q1

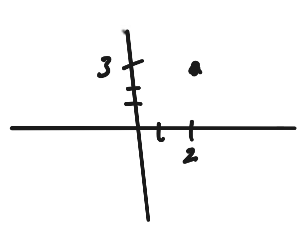
Q.3

B. $y=-f(x)$ ✗ $(-2,-3)$

C. $y=-f(-x)$ $(2,-3)$ Q.4

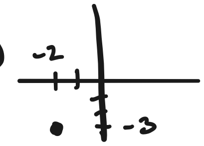
D. $y=\frac{1}{f(x)}$ $(-2,\frac{1}{3})$ Q.2

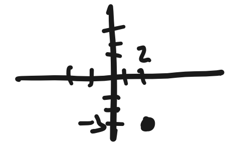




$y=-f(-x)$

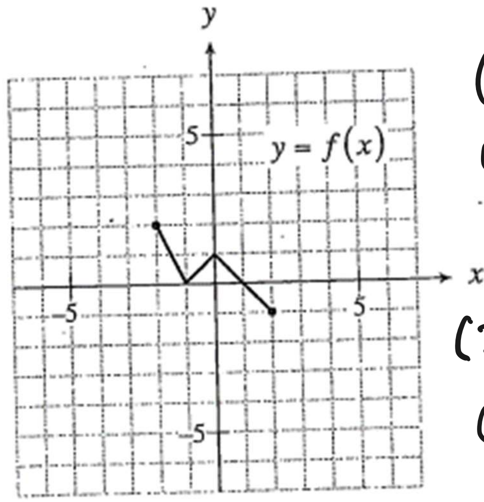
$y=-f(x)$





18.

The graph of $y = f(x)$ is shown below.



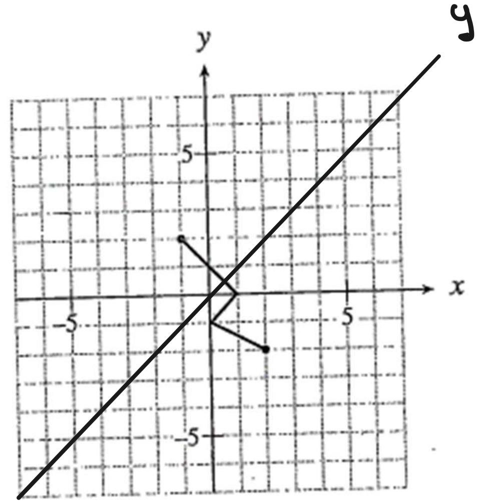
(-2,2), (-1,0), (0,1), (1,0)
(2,-1)

(2,-2), (0,-1), (1,0) (0,1)
(-1, 2)

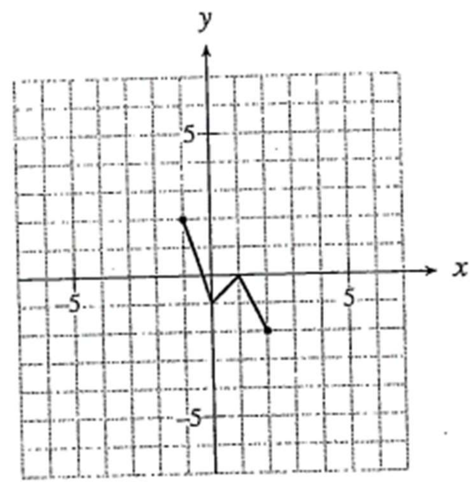
Which of the following is the graph of $x = f(y)$?

$y = x$

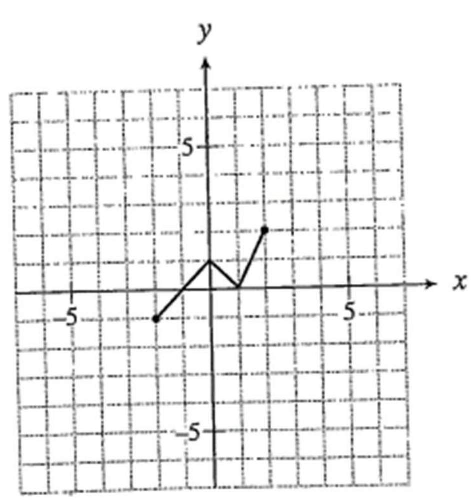
A.



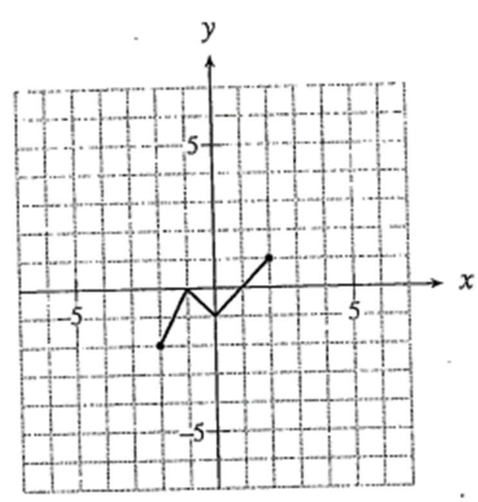
B.



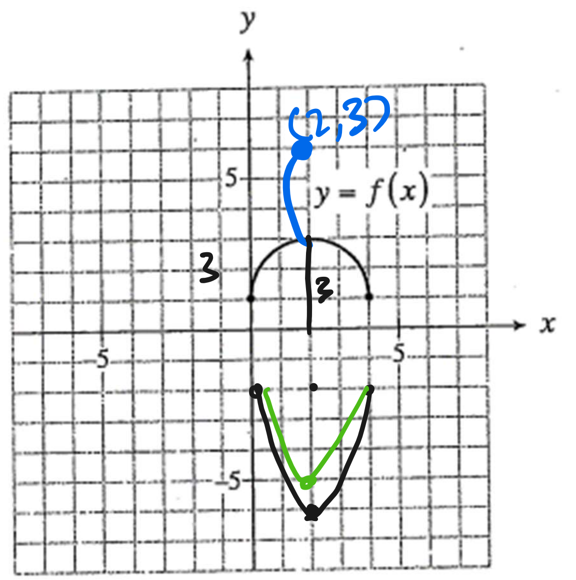
C.

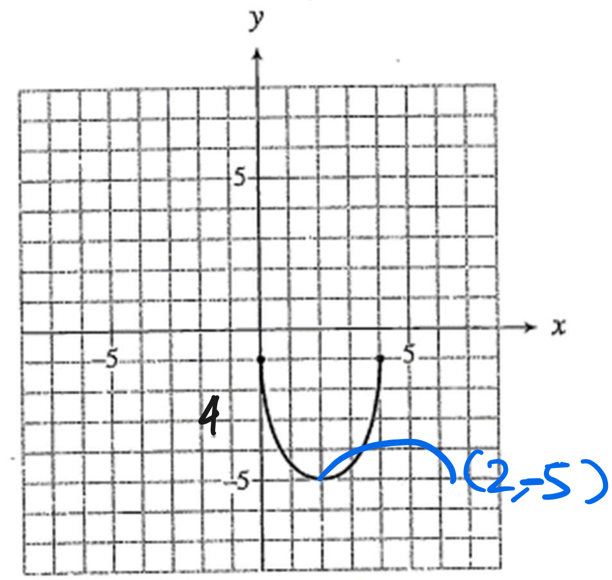


D.



19. The graph of $y = f(x)$ is shown on the left. Determine an equation of the function graphed on the right.





A. $y = -2f(x)$
B. $y = -2f(x) + 1$
C. $y = -2f(x) - 1$
D. $y = -2f(x) - 3$

$(2,3) \Rightarrow (2,-5)$

$(2,-6)\ +1$

$(2,-5)$

Learn Radical Domain & Range

Set to greater & equal to

20. Which radical function has a domain of $x \le 3$ and the range of $y \ge 2$?

$y \le 2$

~~A.~~ $y = -\boxed{\sqrt{x-3}} + 2$ $\quad x - 3 \ge 0 \quad x \ge 3$

~~B.~~ $y = -\sqrt{x+2} + 3$ $\quad y \le 3 \quad x + 2 \ge 0 \quad x \ge -2$

~~C.~~ $y = \sqrt{-x-3} + 2$ $\quad y \ge 2 \quad -x - 3 \ge 0 \quad -x \ge 3 \quad x \le -3$

D. $y = \sqrt{-(x-3)} + 2$ $\quad -(x-3) \ge 0 \quad x - 3 < 0 \quad \underline{x < 3}$

$\boxed{y \ge 2}$

$y = -\sqrt{2x+1} + 5$

<u>domain</u> <u>Range</u>

$2x + 1 \ge 0$

$2x > -1$

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

$y = \leq 5$

Multiple-Choice: Part 2 Calculator Permitted

21. Determine the restriction(s) for $\dfrac{3\cos x - 1}{3\cos x + 1}$.

A. $\cos x \neq \frac{1}{3}$

B. $\cos x \neq -\frac{1}{3}$

C. $\cos x \neq -\frac{1}{3}$, $\cos x \neq \frac{1}{3}$

D. $\cos x \neq -\frac{1}{3}$, $\cos x \neq \frac{1}{3}$, $\cos x \neq 0$

$3\cos x + 1 = 0$

$3\cos x = -1$

$\cos x \neq -\frac{1}{3}$

xxt Hardest Question so far

$\sin 2\theta = 2\sin\theta\cos\theta$

22. The terminal arm of angle θ in standard position intersects the unit circle at the point (m, n). Which expression represents $\csc 2\theta$?

A. $\frac{2}{n}$

B. $\frac{2}{m}$

C. $\frac{1}{2mn}$

D. $\frac{1}{m^2 - n^2}$

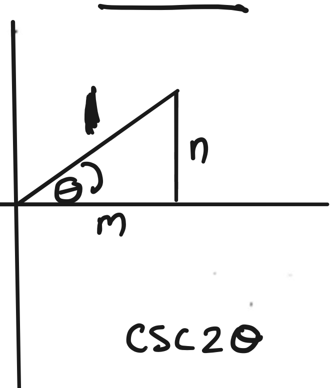
$\sin 2\theta = 2\left[\frac{n}{\sqrt{m^2+n^2}}\right]\left[\frac{m}{\sqrt{m^2+n^2}}\right]$

$\frac{1}{\sin 2\theta = 2\left[\frac{n}{\sqrt{n^2+n^2}}\right]\left[\frac{m}{\sqrt{m^2+n^2}}\right]}$

$\sin 2\theta = \frac{2(nm)}{m^2+n^2}$

$\frac{1}{\frac{2nm}{m^2+n^2}} = \csc 2\theta$

$\frac{m^2+n^2}{2nm} = \csc 2\theta$



$\csc 2\theta$

$\frac{1}{\sin 2\theta}$

$m^2 + n^2 = x^2$

$x = \sqrt{m^2+n^2}$

$\frac{n}{\sqrt{m^2+n^2}}$

$\boxed{\cos\theta = \frac{m}{\sqrt{m^2+n^2}} \quad \sin\theta = \frac{n}{\sqrt{m^2+n^2}}}$

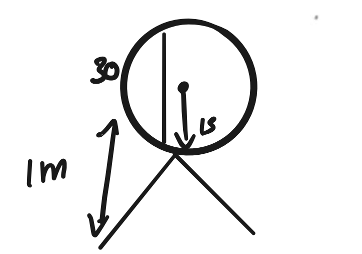
23. Nicole is riding a Ferris wheel that has a radius of 15 m and rotates once every 48 s. At time $t = 0$, Nicole is 1 m above the ground, which is the lowest point of the rotation of the Ferris wheel. Determine a sinusoidal function that gives Nicole's height, h, above the ground as a function of t, where h is in metres and t is in seconds.

~~A.~~ $h = -15\cos\frac{\pi}{24}t + 1$

B. $h = -15\cos\frac{\pi}{24}t + 16$

~~C.~~ $h = -15\cos\frac{\pi}{48}t + 1$

D. $h = -15\cos\frac{\pi}{48}t + 16$



$P = 48$

$B = \frac{2\pi}{48} = \frac{\pi}{24}$

$VD = \frac{max + min}{2} = \frac{31+1}{2} = \frac{32}{2} = 16$

$A = \frac{max - min}{2} = \frac{31-1}{2} = 15$

$a, ar, ar^2,$

24. Determine the 3rd term of the geometric sequence x, $x(x+1)$, … where $x \neq 0$, $x \neq -1$.

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

$x, x(x+1), x(x+1)^2$

$\frac{x(x+1)}{\cancel{x}} = x+1 = r$

$t_1 = x$
$r = x+1$

$t_3 = t_1 r^{3-1}$

$\boxed{t_3 = x(x+1)^2}$

$\boxed{t_n = ar^{n-1} \quad t_n = t_1 r^{n-1}}$

25. The 3rd term of a geometric sequence is 9 and the 6th term is $\frac{8}{3}$. Determine the 8th term.

A. $\frac{2}{3}$
B. $\frac{32}{27}$
C. $\frac{81}{4}$
D. 6

$t_3 = 9$

$t_6 = \frac{8}{3}$

$t_n = ar^{n-1}$

$t_3 = \boxed{9 = ar^2}$

SUB

$t_6 = \frac{8}{3} = ar^5$

$t_8 = \frac{81}{4}\left(\frac{2}{3}\right)^7 = \frac{81 \cdot 2^7}{4 \cdot 3^7}$

$\frac{\cancel{a}r^5}{\cancel{a}r^2} = \frac{8/3}{9}$

$r^3 = \frac{8}{3} \cdot \frac{1}{9}$

$r^3 = \frac{8}{27}$

$r = \sqrt[3]{\frac{8}{27}} = \frac{2}{3}$

$9 = a\left(\frac{2}{3}\right)^2$

$9 = \frac{4a}{9}$

$a = 9 \cdot \frac{9}{4} = \frac{81}{4}$

$\frac{128}{27 \cdot 4} = \frac{32}{27}$

26. Determine the sum of the first 10 terms of the geometric series $4 - 16 + 64 - \ldots$

A. −838 860
B. −209 716
C. 209 716
D. 838 861.6

$S_n = \frac{a(1-r^n)}{1-r}$, $r \neq 1$

$\frac{-16}{4} = -4 = R$

$4 = A$

$S_{10} = \frac{4(1-(-4)^{10})}{1-(-4)} =$

can't go inside with negative becaus exponent

27. If x, -8, x^2 are three consecutive terms in a geometric sequence, determine the value of the common ratio.

Baited

A. −4
B. −2
C. 2
D. 4

$R = \frac{-8}{x}$

$R = \frac{x^2}{-8}$

$\frac{-8}{x} = \frac{x^2}{-8}$

$64 = x^3$

$\sqrt[3]{64} = 4$

if two thing are rep the same thing equate

$$-\frac{8}{4} = -2$$

28. Determine an expression for the number of terms in the expansion of $\sum_{k=3a}^{12a} 3(2)^{k-1}$.

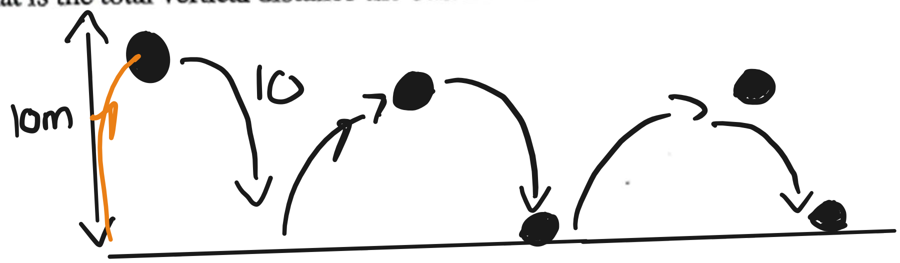
A. $9a$
B. $10a$
C. $12a$
D. $9a+1$

$A = 3a$
last term $= 12a$
terms $=$ last $-$ first $+1$
$12a - 3a + 1$
$9a + 1$ terms

29. I got this one wrong

A ball is dropped from a height of 10 m. After each bounce it rises to 56% of its previous height. What is the total vertical distance the ball travels before it comes to rest?

A. 22.73
B. 35.45
C. 45.45
D. 56.00



add extra 10 manually

initial # is doubled

30. Determine an equivalent expression for $\log\left(\frac{ab^2}{\sqrt{c}}\right)$.

A. $\log a + \log 2b - \log \frac{1}{2} c$

B. $2\log a + \log b - \frac{1}{2}\log c$

C. $\log a + 2\log b - \frac{1}{2}\log c$

D. $2\log a + 2\log b - \frac{1}{2}\log c$

$\log a + \log b^2 - \log c^{1/2}$

$\log a + 2\log b - \frac{1}{2}\log c$

$10 + 10 + 10(0.56)(2) + 10(0.56)^2(2) + \dots$

$20 + 20(0.56) + 20(0.56)^2 + \dots$

geometric $\frac{a}{1-r}$

$\frac{20}{1-0.56} - 10$

$$10 + \boxed{10(0.56)(2) + 10(0.56)^2(2) + 10(0.56)^3(2)}$$

not part of geometric

$$10 + \frac{20(0.56)}{1-0.56} = 10 + \frac{11.2}{0.44} = 35.45$$

31. Change to logarithmic form: $a = c^b$

A. $\log_c a = b$
B. $\log_c b = a$
C. $\log_a c = b$
D. $\log_b a = c$

$\log a = b \log c$

$\frac{\log a}{\log c} = b$

$\log_c a = b$

32. Brittany invests \$10 000 in a bond which pays interest at a rate of 6% per annum compounded monthly. Which equation can be used to determine the final amount, A, of this investment in 4 years?

$A = A_0 (1+\frac{r}{n})^{nt}$

A. $A = 10\,000(1.06)^4$

B. $A = 10\,000(1.06)^{48}$

C. $A = 10\,000(1.005)^4$

D. $A = 10\,000(1.005)^{48}$

$A_0 = 10000$

$r = 0.06$

$n = 12$

$A = 10000\,(1.06)^{\overset{48}{(12)(4)}}$

$\log_{10} 10^x = x$ $\quad$ $\ln e^x = x$

I do not know, but I tr

33. Solve $900 = 3e^{0.025x}$

A. 228.151

B. 300

C. 99.085

D. 0.143

$\frac{900}{3} = \frac{\cancel{3}e^{0.025x}}{\cancel{3}}$

$300 = e^{0.025x}$

$\ln 300 = \ln e^{0.025x}$

$\frac{\ln 300}{0.025} = \frac{\cancel{0.025}x}{\cancel{0.025}}$

$x = 228.15$

$$\boxed{\begin{gathered}\ln 900 = \ln 3e^{0.025x} \\ \ln 900 = \ln 3 + \ln e^{0.025x} \\ \ln 900 - \ln 3 = \ln e^{0.025x} \\ \ln\left(\frac{900}{3}\right) = 0.025x \\ \frac{\ln 300}{0.025} = x\end{gathered}}$$

$\ln e^x = x$

$\ln(2e^x) = \ln 2 + \ln e^x$

$\ln(2e^x) = \ln 2 + x$

34. Solve $\ln 4.2 = 0.062t$

A. 10.052

B. 0.089

C. 4.216

D. 23.147

$1.435084525 = 0.062t$

$t = 23.147$

35. Solve $\frac{32^{2x-1}}{16^{3x-4}} = 8^{x+6}$

A. $\frac{5}{7}$

B. $\frac{-7}{5}$

C. 7

D. $\frac{-5}{29}$

$\frac{(2^5)^{2x-1}}{(2^4)^{3x-4}} = (2^3)^{x+6}$

$\frac{2^{10x-5}}{2^{12x-16}} = 2^{3x+18}$

$2^{-2x+11} = 2^{3x+18}$

$-2x + 11 = 3x + 18$

$-18 + 11 = 3x + 2x$

$-7 = 5x$

$x = \frac{-7}{5}$

$P(-3) = 4$

$x = -3$

36. When a polynomial $P(x)$ is divided by $(x+3)$, the remainder is 4. Which point must be on the graph of (x) ?

✓ A. $(-3, 4)$

B. $(4, -3)$

C. $(-3, -4)$

D. $(-4, -3)$

Remainder = y, so 4

$(-3, 4)$

$-x^4$

2 1 1 degree 4

37. For what values of **x** is the function $f(x) = -(x+1)^2(x-1)(x-3)$ positive?

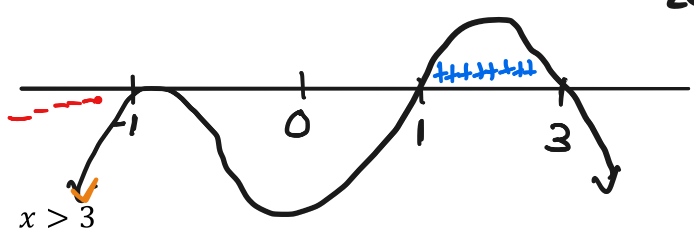
Zero not part of question

A. $1 < x < 3$

B. $-1 < x < 1, \quad x > 3$

C. $x < -1, \quad 1 < x < 3$

D. $x < -1, \quad -1 < x < 1, \quad x > 3$



38. When the polynomial $P(x) = kx^{40} + 2x^{25} - 4x - 6$ is divided by $(x+1)$, the remainder is 23. Find the value of k.

$P(-1) = 23$

A. 23

B. 27

C. 35

D. 40

$P(-1) = kx^{40} + 2x^{25} - 4x - 6$

$23 = k(-1)^{40} + 2(-1)^{25} - 4(-1) - 6$

$23 = k - 2 + 4 - 6$

$23 = k - 4$

$k = 27$

39. The polynomial $P(x) = ax^3 + x^2 - 13x + k$ has y-intercept 6 and x-intercept 2. Find all other x-intercepts.

Hard

A. $\frac{-1}{2}$ *and* -3

B. $\frac{-1}{2}$ *and* 3

C. $\frac{1}{2}$ *and* -3

D. $\frac{1}{2}$ *and* 3

$P(x) = a(2)^3 + (2)^2 - 13(2) + 6$

$8a + 4 - 26 + 6$

$8a - 16 = 0$

$8a = 16$

$a = \frac{16}{8}$

$a = 2$

$$\begin{array}{r|l} & 2x^2 + 5x - 3 \\ \hline x - 2 & 2x^3 + x^2 - 13x + 6 \\ & -(\cancel{2x^3} - 4x^2) \\ \hline & \cancel{5x^2} - 13x + 6 \\ & -(\cancel{5x^2} - 10x) \\ \hline & \cancel{-3x} + 6 \\ & -(\cancel{-3x} + 6) \\ \hline & 0 \end{array}$$

$\overset{-6}{2x^2 + 5x - 3}$

$2x^2 + 6x - x - 3 = 0$

$2x(x+3) - 1(x+3) = 0$

$P(x) = ax^3 + x^2 - 13x + 6$

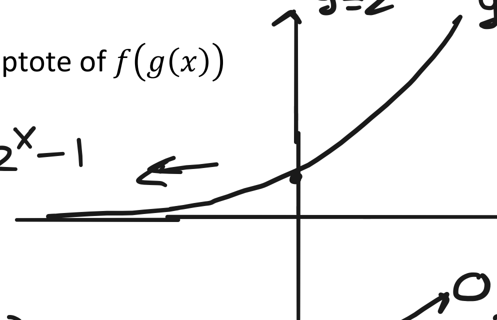
$P(2) = 0$

$(2x-1)(x+3)=0$

$x=\frac{1}{2} \quad x=-3$

$0=a(8)+4-26+6$

$a=2$



40. $f(x) = 3x + 5 \quad and \quad g(x) = 2^x - 1$ Find the asymptote of $f(g(x))$

A. $y = -1$

B. $y = 5$

C. $y = 2$

D. $y = 8$

$fx = 3x+5 \;/\; gx = 2^x - 1$

Put g inside f(x)

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

$2^{-100} = \frac{1}{2^{100}} = 0 \qquad \lim_{x\to-\infty} \to 0$

$3(0-1) = -3$

$y = 3(2^x) + 2$ — $2^x \to 0$ as $x \to -\infty$

$x \to \infty \quad y \to \infty$

$x \to -\infty \quad y \to 2$

41. If $f(x) = x^2 - 4$ and $g(x) = \sqrt{4 - x^2}$, find the domain of $(f \circ g)(x)$

A. $x \geq 0$

B. $x \leq -2, \ x \geq 2$

C. $\boxed{-2 \leq x \leq 2}$

D. all real numbers

Hard — Check domain not breaking rules along the way

$f(g(x)) = f(\sqrt{4-x^2}) = (\sqrt{4-x^2})^2 - 4$

$= \cancel{4} - x^2 \cancel{-4}$

$= -x^2$

$4 - x^2 \geq 0$

$-x^2 \geq -4$

$\sqrt{x^2} \leq \sqrt{4}$

$|x| \leq 2$

$\boxed{-2 \leq x \leq 2}$

42. Find the point of discontinuity for $f(x) = \frac{x^2-9}{x^2-2x-3}$

A. $(-3, \ 0)$

B. $(3, \ 0)$

C. $(3, \ 1)$

D. $\left(3, \frac{3}{2}\right)$

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

$x \neq 3$

$\frac{3+3}{3+1} = \frac{6}{4} = \frac{3}{2}$

43. Find the x-intercept for $y = \frac{7}{x+5} - 3$

A. -5

B. 3

C. $\frac{-8}{3}$

D. $\frac{-3}{5}$

$0 = \frac{7}{x+5} - 3$

$3 = \frac{7}{x+5}$

$3(x+5) = 7$

$3x+15 = 7$

$3x = 7 - 15$

$3x = -8$

$x = \frac{-8}{3}$

Horizontal Asymptote

$y = \frac{7}{x+5} - 3$

$y = \frac{\left(\frac{7}{x}\right)=0}{\left(\frac{x}{x}\right)\left(+\frac{5}{x}\right)} \quad 1 \quad 0$

$y = 0 - 3$

$y = -3$

Written Response

1. Given the function $f(x)=\frac{3x+1}{x}$, determine $f^{-1}(x)$

$y=\frac{3x+1}{x}$

$x=\frac{3y+1}{y}$

$xy=3y+1$

$xy-3y=1$

$y(x-3)=1$

$y=\frac{1}{x-3}$

2. A nuclear explosion releases Strontium-90, which has a half-life of 28 years. How long after the explosion will exactly 1% of Strontium-90 remain. Solve using logarithms. Answer accurate to at least 2 decimal places. $A=A_0(1/2)^{t/T}$

$T=28$ $A=1$ $A_0=100$

$1=100(1/2)^{t/28}$ => $0.01=(0.5)^{t/28}$

$\log(0.01)=\frac{t}{28}\log(0.5)$

$6.64=\frac{t}{28}$ => $t=186.03$

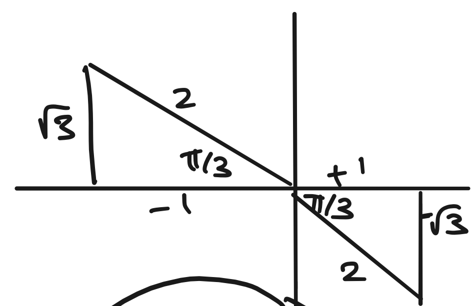
3. Solve algebraically $0\le\theta<2\pi$. Answer using exact.

$$\tan\theta\sin\theta+\sqrt{3}\sin\theta=0$$

=> $\frac{\sin\theta}{\cos\theta}\cdot\frac{\sin\theta}{1}+\sqrt{3}\sin\theta$

=> $\frac{\sin^2\theta}{\cos\theta}=-\sqrt{3}\sin\theta$ => $\frac{\sin^{\cancel{2}}\theta}{\cos\theta}\cdot\frac{1}{\cancel{\sin\theta}}=-\sqrt{3}$ => $\frac{\sin\theta}{\cos\theta}=-\sqrt{3}$

$\tan\theta=-\sqrt{3}$



$2\pi/3,\ 5\pi/3$

4. Graph the function $y=\frac{2x^2-x-6}{x^2+2x-8}$ show all asymptotes and points of discontinuity. Use at least 4 points.

5. Prove the identity

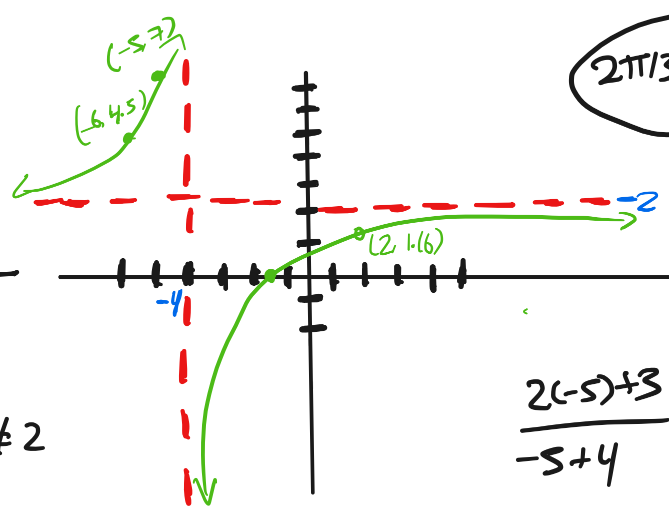
$$\frac{\cos 2\theta-\cos\theta}{\sin 2\theta+\sin\theta}=\frac{1-\sec\theta}{\tan\theta}$$

$2x^2-4x+3x-6$

$\frac{2x(x-2)+3(x-2)}{(x+4)(x-2)}$

$\frac{(2x+3)\cancel{(x-2)}}{(x+4)\cancel{(x-2)}}$ $x\neq 2$

$\frac{(2x+3)}{(x+4)}$



$VA=-4$

$HA=\frac{2x}{x}+\frac{3}{x}$ => 2

$\frac{2(2)+3}{2+4}=\frac{7}{6}=1.16$

$1=\frac{x}{x}\ \frac{4}{x}$ => 0

X intercept: $2x+3=0$

$2x=-3$

$x=\frac{-3}{2}=-1.5$

$\frac{2(-5)+3}{-5+4}=\frac{-10+3}{-1}=\frac{-7}{-1}=7$

$(-5,7)$

$\frac{2(-6)+3}{-6+4}=\frac{-12+3}{-2}=4.5$

$(-6,4.5)$

Answers

Multiple Choice:

1.	A	11.	B	21.	B	31.	A	41.	C
2.	C	12.	B	22.	C	32.	D	42.	D
3.	D	13.	B	23.	B	33.	A	43.	C
4.	A	14.	D	24.	A	34.	D		
5.	D	15.	A	25.	B	35.	B		
6.	A	16.	C	26.	A	36.	A		
7.	D	17.	C	27.	B	37.	A		
8.	C	18.	A	28.	D	38.	B		
9.	A	19.	B	29.	B	39.	C		
10.	D	20.	D	30.	C	40.	C		

Written:

1. $y = \frac{1}{x-3}$

2. 186.03

3. $0, \pi, \frac{2\pi}{3}, \frac{5\pi}{3}$

4. The asymptotes are at x=-4 and y=2

   Points on the real axis (-9, 3), (-5, 7), (-3, -3), (1, 1)

5. See solutions

5. Prove the identity

$$\frac{\cos 2\theta - \cos\theta}{\sin 2\theta + \sin\theta} = \frac{1 - \sec\theta}{\tan\theta}$$

$\sqrt{3}$ | $\cos^2\theta - \cos\theta$

$(\cos\theta)^2 - \cos\theta$

$\cos\theta(\cos\theta - 1)$

$$\frac{2\cos^2\theta - 1 - \cos\theta}{2\sin\theta\cos\theta + \sin\theta}$$

$$2\cos^2\theta - \cos\theta - 1$$

$\sin\theta\,(2\cos\theta+1)$

$$\frac{\cancel{(2\cos\theta+1)}(\cos\theta-1)}{\sin\theta\,\cancel{(2\cos\theta+1)}}$$

$$\frac{\cos\theta-1}{\sin\theta}$$

$$\frac{1-\sec\theta}{\tan\theta}$$

$$=\frac{1-\frac{1}{\cos\theta}}{\frac{\sin\theta}{\cos\theta}}$$

$$=\frac{\cos\theta-1}{\cancel{\cos\theta}}\cdot\frac{\cancel{\cos\theta}}{\sin\theta}$$

$$\boxed{\frac{\cos\theta-1}{\sin\theta}\qquad=\frac{\cos\theta-1}{\sin\theta}}$$