NAME: _____ BLOCK: _____ DATE: _____

PMATH 12 - FINAL REVIEW QUESTIONS

Multiple Choice

Identify the choice that best completes the statement or answers the question.

1. *Divide: $(-4x^2 + 22x + 12) \div (x - 6)$

   A. $4x + 6$ B. $4x - 48$ C. $-4x + 12$ D. $-4x - 2$

2. *What is the remainder when $x^3 + 4 - 11x + 3x^2$ is divided by $6 + x$?

   A. 70 B. –62 C. –38 D. 46

3. *For the polynomial $P(x) = -3x^2 - 4x - 5$, what is the value of $P(-2)$?

   A. –25 B. 15 C. –21 D. –9

4. Which two binomials are factors of $x^4 + 8x^3 + 7x^2 - 40x - 60$?

   A. $x + 2$ and $x - 6$
   B. $x - 2$ and $x - 6$
   C. $x - 2$ and $x + 6$
   D. $x + 2$ and $x + 6$

5. Use graphing technology. Graph the polynomial function $f(x) = x^3 - 7x^2 + 11x - 5$. Which characteristics apply to the graph?

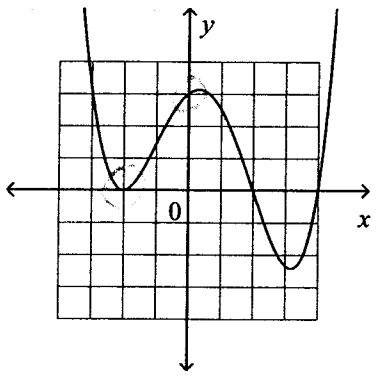
   A. Number of x-intercepts: 3
   Number of hills: 1
   Number of valleys: 1

   B. Number of x-intercepts: 2
   Number of hills: 2
   Number of valleys: 1

   C. Number of x-intercepts: 2
   Number of hills: 1
   Number of valleys: 1

   D. Number of x-intercepts: 1
   Number of hills: 1
   Number of valleys: 2

6. *The graph of a polynomial function of degree 4 is shown. Which statements are true?
   i) The function has an even degree.
   ii) The function has a zero of multiplicity 2.
   iii) The equation of the function has a negative leading coefficient.
   iv) The y-intercept is positive.



   A. i, ii, iii B. i, iii, iv C. ii, iii, iv D. i, ii, iv

7. *Determine the zeros of the polynomial function $f(x) = (x+2)^4(x-5)$. State the multiplicity of each zero.

A. The zero 4 has multiplicity 2; the zero 1 has multiplicity –5.
B. The zero 4 has multiplicity –2; the zero 1 has multiplicity 5.
C. The zero –2 has multiplicity 4; the zero 5 has multiplicity 1.
D. The zero 2 has multiplicity 4; the zero 5 has multiplicity 1.

8. Use graphing technology to solve: $\sqrt{3x-1} = -x+5$
Give the solution to the nearest tenth.

A. $x \doteq 10.5$ **B.** $x \doteq 10.8$ **C.** $x \doteq 2.2$ **D.** $x \doteq 2.5$

9. *The graph of which function below has a hole?

A. $y = \dfrac{x+2}{x^2+2}$ **B.** $y = \dfrac{x^2-9}{x+3}$ **C.** $y = \dfrac{x^2}{x-4}$ **D.** $y = \dfrac{x^2-3}{x^2-2}$

10. *What is the equation of the vertical asymptote of the graph of this function?

$$y = \frac{x+4}{x^2+10x+25}$$

A. $x = -5$
B. $x = 0$
C. $x = -4$
D. The graph has no vertical asymptote.

11. What is the solution of this rational equation, to the nearest tenth if necessary?

$$\frac{4}{x-1} = -8$$

A. $x \doteq 1.5$ **B.** $x \doteq 0.5$ **C.** $x \doteq -1.5$ **D.** $x \doteq -0.5$

12. *State the domain of this function.

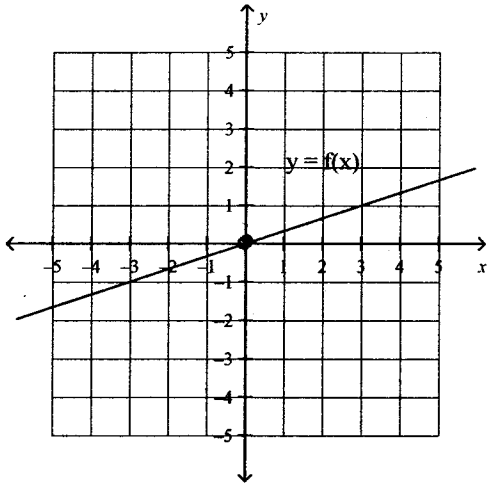
$$y = \frac{x^2+7x+10}{-2-x}$$

A. $x \neq \pm 2$ **B.** $x \neq -2$ **C.** $x \neq -2, x \neq -5$ **D.** $x \in \mathbb{R}$

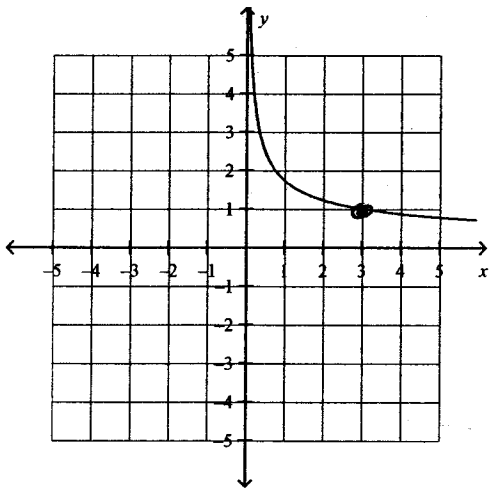
13. *The graph of $y = f(x)$ is translated 4 units down. What is the equation of the translation image in terms of the function f?

A. $y = f(x+4)$ **B.** $y+4 = f(x)$ **C.** $y-4 = f(x)$ **D.** $y = f(x-4)$

14. *For the graph of $y = f(x)$ shown below, which graph best represents $y = \sqrt{f(x)}$?



A.



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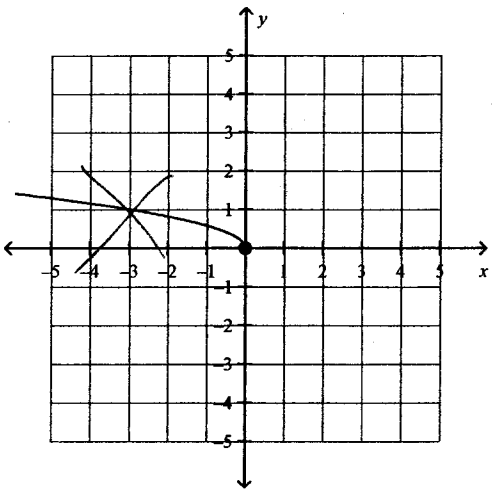
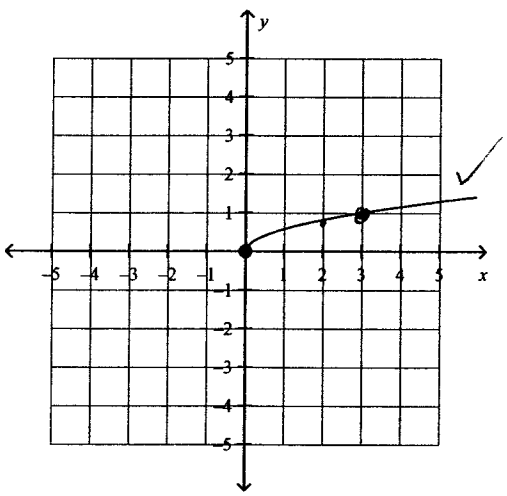
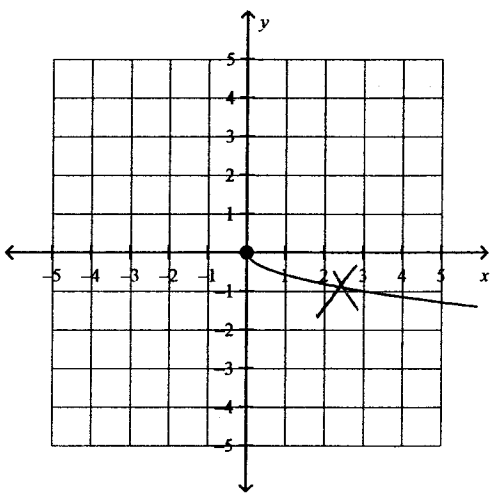


B.

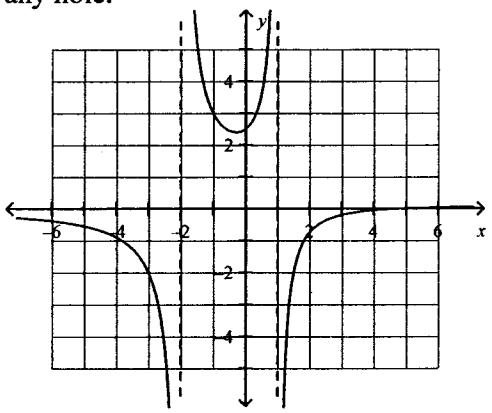


D.



15. *For the graph of this rational function, state the domain and write the equations of any asymptotes and the coordinates of any hole.

$y = \dfrac{x-5}{x^2+x-2}$



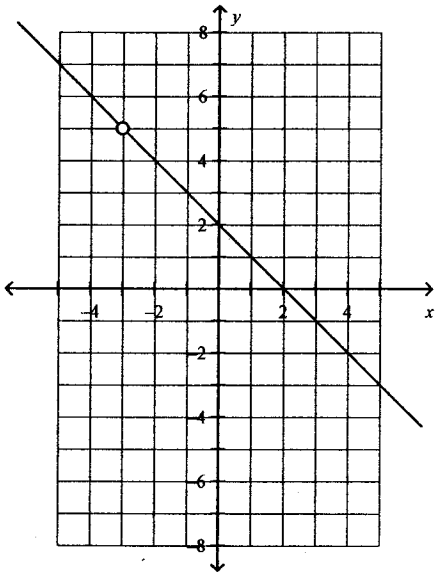
A. domain: $x \neq 1$ and $x \neq -2$;
vertical asymptotes: $x = 1, x = -2$;
horizontal asymptote: $y = 1$

B. domain: $x \neq 1$ and $x \neq -2$;
hole: $(-2,-7)$
vertical asymptote: $x = 1$;
horizontal asymptote: $y = 0$

C. domain: $x \neq 0$;
hole: $(0,-7)$
vertical asymptote: $x = 0$;
horizontal asymptote: $y = 0$

D. domain: $x \neq 1$ and $x \neq -2$;
vertical asymptotes: $x = 1, x = -2$;
horizontal asymptote: $y = 0$

16. *Which function below describes this graph?



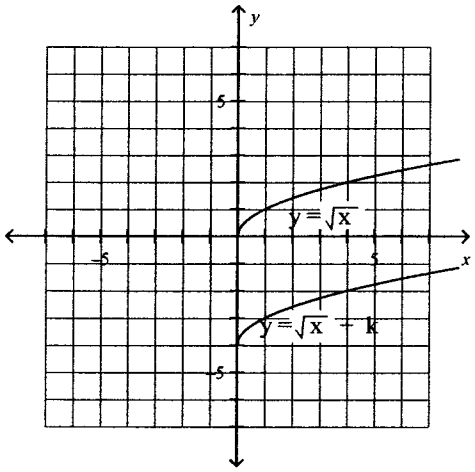
A. $y = \dfrac{-x^2-x+6}{x-3}$

B. $y = \dfrac{-x^2-x+6}{x+3}$

C. $y = \dfrac{-x^2+6x+1}{x+3}$

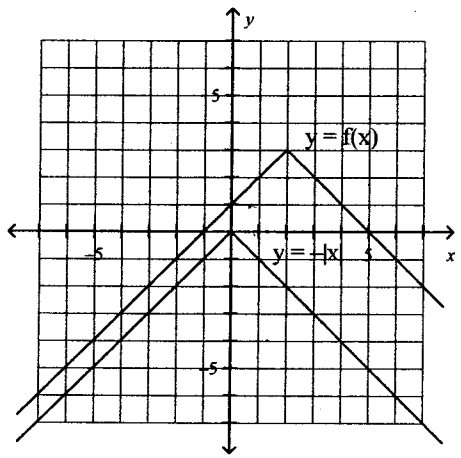
D. $y = \dfrac{x+3}{-x^2-x+6}$

17. *The graph of $y = \sqrt{x} + k$ is the image of the graph of $y = \sqrt{x}$ after a single translation. What is the value of k?



A. 5 **B.** –4 **C.** 4 **D.** –5

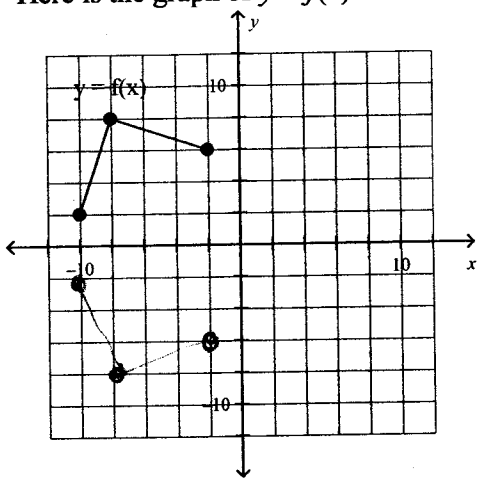
18. *The graph of $y = f(x)$ is the image of the graph of $y = -|x|$ after a horizontal and vertical translation. What is an equation of the image graph?



↑3 → 2

A. $y - 3 = -|x|$ **B.** $y - 3 = -|x - 2|$ **C.** $y - 3 = |x + 2|$ **D.** $y - 2 = -|x - 3|$

19. *Here is the graph of $y = f(x)$. What are the domain and range of its image after a reflection in the x-axis?



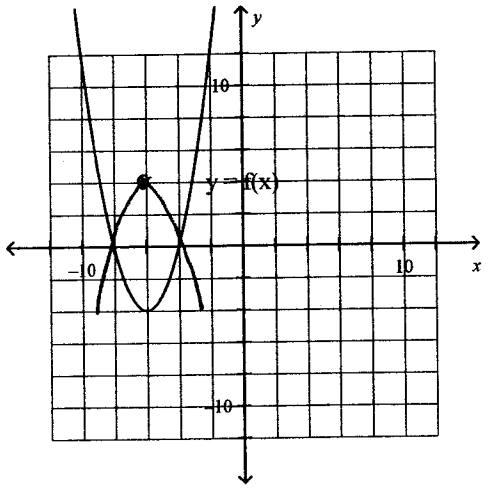
A. domain: $-10 \le x \le -2$ ✓ range: $-8 \le y \le -2$ ✓

B. domain: $2 \le x \le 10$ ✗ range: $2 \le y \le 8$

C. domain: $2 \le x \le 10$ ✗ range: $-8 \le y \le -2$

D. domain: $-10 \le x \le -2$ ✓ range: $2 \le y \le 8$ ✗

20. *Here is the graph of $y = f(x)$. What are the domain and range of $y = -f(x)$?



A. domain: $x \in \mathbb{R}$ ✓ range: $y \le 4$

B. domain: $x \in \mathbb{R}$ ✓ range: $y \le 4$ ✓

C. domain: $x \le 6$ ✗ range: $y \ge 4$ ✗

D. domain: $x \in \mathbb{R}$ ✓ range: $y \in \mathbb{R}$ ✗

21. *The graph of $y = f(x)$ is stretched vertically by a factor of 6. What is the equation of the image graph in terms of the function f?

$a = 6$

A. $y = 6f(x)$

B. $y = \frac{1}{6}f(x)$

C. $y = f(6x)$

D. $y = f(\frac{1}{6}x)$

22. *The point A (16,64) lies on the graph of $y = \sqrt{x^3}$. What are the coordinates of its image A′ on the graph of $y = \frac{1}{4}\sqrt{(2x)^3}$?

A. (8,16) B. (8,32) C. (4,16) D. Not enough information is given.

23. *The graph of $y = f(x)$ is horizontally compressed by a factor of $\frac{1}{3}$, vertically compressed by a factor of $\frac{1}{2}$, and reflected in the y-axis. What is an equation of the image graph in terms of the function f?

A. $y = \frac{1}{2}f(-3x)$ B. $y - 3 = f(x - \frac{1}{2})$ C. $y - \frac{1}{2} = f(x - 3)$ D. $y = -3f(\frac{1}{2}x)$

24. *Which statement below describes how the graph of $y = f(x)$ has been transformed to get the graph of $y = f(-\frac{1}{3}(x-2))$? It is the image of the graph of $y = f(x)$ after:

A. a vertical compression by a factor of $\frac{1}{3}$, a reflection in both axes, and a translation of 2 units right.

B. a vertical stretch by a factor of 3, a reflection in the y-axis, and a translation of 2 units down.

C. a horizontal stretch by a factor of 3, a reflection in the y-axis, and a translation of 2 units right.

D. a horizontal compression by a factor of $\frac{1}{3}$, a reflection in the y-axis, and a translation of 2 units right.

25. *Determine an equation of the inverse of the function $y = -6x - 5$.

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

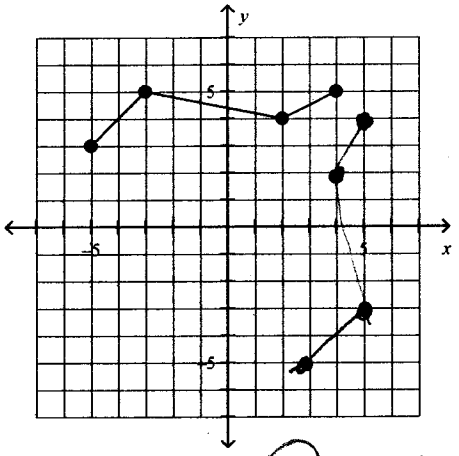
26. *Given $f(x) = x - 1$ and $g(x) = 3x^2 + 2$, what is an explicit equation for $p(x) = f(x) \cdot g(x)$?

A. $p(x) = 4x^3 + 3x^2 + 2x - 2$ C. $p(x) = 3x^2 - x - 2$
B. $p(x) = 3x^2 + x + 1$ D. $p(x) = 3x^3 - 3x^2 + 2x - 2$

27. *Given $f(x) = x + 2$ and $g(x) = x^2 - 25$, what is the domain of $q(x) = \frac{f(x)}{g(x)}$?

A. $x \neq 25$ B. $x \neq 5, x \neq -5$ C. $x \neq -2$ D. $x \in \mathbb{R}$

28. *Here is the graph of $y = f(x)$. What are the domain and range of its inverse?



inverse
$(4,5) \rightarrow (5,4)$

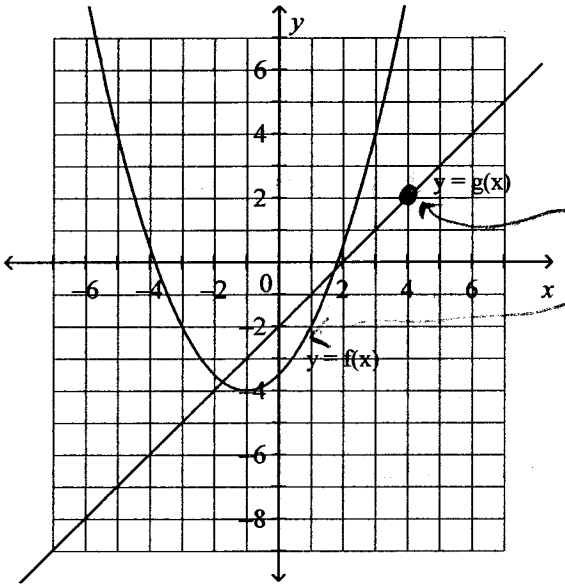
A. Domain: $-5 \le x \le 4$ Range: $-5 \le y \le -3$

B. Domain: $3 \le x \le 5$ Range: $-5 \le y \le 4$

C. Domain: $-5 \le x \le 4$ Range: $3 \le y \le 5$

D. Domain: $3 \le x \le 5$ Range: $-4 \le y \le 5$

29. *Given the graphs of $y = f(x)$ and $y = g(x)$, what is the value of $f(g(3))$?



$g(3) = 1$

$f(1) = -2$

A. 4 **B.** –2 **C.** 2 **D.** –4

30. *Given $f(x) = \sqrt{4-x}$ and $g(x) = 3 - 5x$, what is an explicit equation for $f(g(x))$?

A. $f(g(x)) = 3 - \sqrt{4-5x}$

B. $f(g(x)) = 1 - \sqrt{4-5x}$

C. $f(g(x)) = \sqrt{1-5x}$

D. $f(g(x)) = \sqrt{5x+1}$

$\sqrt{4-(3-5x)}$

$\sqrt{4-3+5x}$

$\sqrt{1+5x}$

31. *Use these tables. What is the value of $f(f(0))$?

x	$f(x)$
–3	18
–2	11
–1	6
0	3
1	2
2	3
3	6

A. –2 **B.** 6 C. 2 D. 0

32. *Given $f(x)=\sqrt{2-x}$ and $g(x)=x^2+6x-3$, which is an explicit equation for the composite function $h(x)=g(f(x))$, and what is its domain?

A. $h(x)=\sqrt{-x^2-6x+5}$, $x\geq 0$

B. $h(x)=-1-x$, $x\in\mathbb{R}$

C. $h(x)=\sqrt{-1-x}$, $x\leq -1$

D. $h(x)=-1-x+6\sqrt{2-x}$, $x\leq 2$

33. *Which exponential function is increasing?

A. $y=\left(\frac{1}{4}\right)^x$ **B.** $y=\left(\frac{4}{3}\right)^x$ C. $y=0.1^x$ D. $y=0.137^x$

34. *What is the y-intercept of the graph of $y=4^{-4x}+3$?

A. 1 B. 3 C. 259 **D.** 4

35. *Solve: $2^{x+1}=16$

A. $x=3$ B. $x=\frac{15}{2}$ C. $x=-3$ D. $x=15$

36. *Solve: $125^{-2x}=25^{x-24}$

A. $x=6$ B. $x=8$ C. $x=\frac{25}{3}$ D. $x=3$

37. *Evaluate $\log_2 64$.

A. –6 **B.** 6 C. 32 D. 62

38. *Write this exponential expression as a logarithmic expression: $3^{\frac{2}{3}} = \sqrt[3]{9}$

A. $\frac{2}{3} = \log_3\left(\sqrt[3]{9}\right)$

B. $3 = \log_{\frac{2}{3}}\left(\sqrt[3]{9}\right)$

C. $\frac{2}{3} = \log_{\sqrt[3]{9}}(3)$

D. $\log_3\left(\frac{2}{3}\right) = \sqrt[3]{9}$

39. *Which of these expressions is NOT equal to $\log 160$?

A. $\log 80 + \log 2$

B. $\log 48 + \log 112$

C. $\log 16 + \log 10$

D. $\log 8 + \log 20$

40. *The graph of $y + 4 = \log_6(x + 8)$ is the image of the graph of $y = \log_6 x$ after it has been

A. translated 8 units left and 4 units up.

B. translated 8 units right and 4 units down.

C. translated 8 units left and 4 units down.

D. translated 8 units right and 4 units up.

41. *Which logarithm is equal to $\log_5(x+6) + \log_5 x$?

A. $\log_5(8x)$

B. $\log_{10}\left(x^2 + 6x\right)$

C. $\log_5(2x+6)$

D. $\log_5\left(x^2 + 6x\right)$

42. *Solve: $3\log 9 = \log x$

A. $x = \frac{1}{3}$

B. $x = 12$

C. $x = 729$

D. $x = 27$

43. *What is the solution of the equation $6\left(5^{x+3}\right) = 4500$?

A. $x = \frac{\log 6}{\log 5}$

B. $x = \frac{\log 4500}{\log 30}$

C. $x = \frac{\log 750}{\log 5}$

D. $x = \log 250$

44. *An account pays 5.0% annual interest, compounded semi-annually (twice a year). What is the interest rate per compounding period, as a decimal?

A. 5.0

B. 0.025

C. 0.05

D. 2.5

45. What is the value of $\sin(-256°)$ to the nearest thousandth?

A. 0.970

B. –0.242

C. –0.970

D. 1.031

46. *What is the measure of the reference angle for an angle of $-546°$ in standard position?

A. $6°$ **B.** $-6°$ **C.** $186°$ **D.** $84°$

47. *What is the length of the arc that subtends a central angle of $80°$ in the unit circle?

A. $\frac{2}{9}\pi$ units **B.** $\frac{9}{4}\pi$ units **C.** 40π units **D.** $\frac{4}{9}\pi$ units

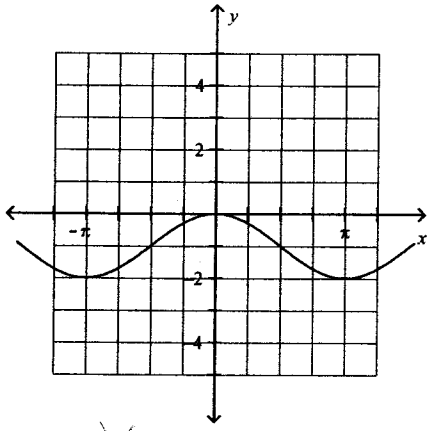
48. *What is $-120°$ in radians?

A. $-\frac{2}{3}\pi$ radians **B.** $\frac{-21\,600}{\pi}$ radians **C.** -120π radians **D.** $-\frac{2}{3}$ radians

49. *What is the amplitude of the function $y = 7\sin x$?

A. -7 **B.** 7 **C.** 14 **D.** 7π

50. *Which function below describes this graph?



A. $y = 2\cos x$ **B.** $y = \cos x$ **C.** $y = \cos x - 1$ **D.** $y = \cos x - 2$

51. *What is the period of the function $y = 7\cos\left(9\left(x + \frac{\pi}{7}\right)\right) + 2$?

A. $\frac{2\pi}{9}$ **B.** $\frac{\pi}{7}$ **C.** 7π **D.** $\frac{9\pi}{2}$

52. *What is the period of the function $y = 5\sin\frac{3\pi}{5}(x+1) + 8$?

A. $\frac{13}{3}$ **B.** $\frac{3}{10}$ **C.** $\frac{10}{3}$ **D.** 2

53. What are the solutions of the equation $\tan x = -\frac{1}{2}$ for $0 \le x \le 2\pi$, to the nearest hundredth?

A. $x \doteq 1.11$ or $x \doteq 2.68$
B. $x \doteq 153.43$
C. $x \doteq 2.68$ or $x \doteq 5.82$
D. $x \doteq -0.55$

54. *Identify the transformations that would be applied to the graph of $y = \cos x$ to get the graph of $y = 7\cos\left(x - \frac{\pi}{2}\right)$.

A. A vertical stretch by a factor of 7, and then a translation of $\frac{\pi}{2}$ units left

B. A vertical stretch by a factor of $\frac{\pi}{2}$, and then a translation of 7 units right

C. A vertical stretch by a factor of 7, and then a translation of $\frac{\pi}{2}$ units right

D. A horizontal stretch by a factor of 7, and then a translation of $\frac{\pi}{2}$ units right

55. What are the solutions of the equation $\cos 2x = -\frac{1}{4}$ for $0 \le x \le \pi$, to the nearest hundredth?

A. $x \doteq 0.91$ or $x \doteq 2.23$
B. $x \doteq 0.91$ or $x \doteq 2.48$
C. $x \doteq 52.24$
D. $x \doteq 1.82$ or $x \doteq 4.46$

56. What are the roots of the equation $2\tan x + 1 = 0$ for $-180° \le x \le 180°$, to the nearest degree?

A. $x \doteq 3°$
B. $x \doteq -27°$ or $x \doteq 153°$
C. $x \doteq -27°$ or $x \doteq 63°$
D. $x \doteq -0°$

57. *Write the expression $\frac{\csc\theta\cot\theta\sin\theta}{\cos\theta}$ as a single term.

A. $\cot\theta$ B. $\csc\theta$ C. $\cos\theta$ D. $\sec\theta$

58. *Write the expression $\sec\theta\left(\sin^2\theta - 1\right)$ as a single term.

A. $\cos\theta$ B. $-\cos^2\theta$ C. $-\cos\theta$ D. $\sec^2\theta$

59. *Write the expression $\sin 5\theta\cos 2\theta + \cos 5\theta\sin 2\theta$ as a single term.

A. $\sin 3\theta$ B. $\sin 7\theta$ C. $\cos 3\theta$ D. $\cos 7\theta$

60. *What is the exact value of the expression $\sin 40°\cos 95° + \cos 40°\sin 95°$?

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

61. *Write the expression $2\sin 4\theta\cos 4\theta$ as a single term.

A. $\cos 8\theta$ B. $\sin 10\theta$ C. $\cos 10\theta$ D. $\sin 8\theta$

62. *At a school cafeteria, a meal consists of a main dish, a side dish, and a dessert. There are 3 main dishes, 4 side dishes, and 7 desserts to choose from. How many different meals are possible?

A. 36 B. 84 C. 45 D. 14

63. *A video game allows a player to customize the appearance of her avitar. There are 5 hair colours, 6 hairstyles, 3 faces, and 8 outfits to choose from. How many different avitars can be created?

A. 720 **B.** 22 **C.** 264 **D.** 280

64. *A security code consists of 3 letters followed by 1 digit. The first letter in the code must be a vowel. How many different security codes are possible?

A. 33 800 **B.** 175 760 **C.** 141 960 **D.** 3390

65. *Which expression cannot be evaluated?

A. ${}_8P_6$ **B.** ${}_{10}P_0$ **C.** ${}_9P_9$ **D.** ${}_{12}P_{14}$

66. *How many 2-letter permutations are there for the word LEARN?

A. 120 **B.** 20 **C.** 6 **D.** 118

67. *What is the value of $\frac{11!}{6!5!}$?

A. $\frac{11}{30}$ **B.** 1 663 200 **C.** 39 916 800 **D.** 462

68. *Which of these numbers has the least number of permutations of all its digits?

A. 445 869 **B.** 859 647 **C.** 444 444 **D.** 444 484

69. *A student has 12 different books on her bookshelf. She wants to take 6 of them with her on a train trip. How many selections of 6 books could she make?

A. 665 280 **B.** 720 **C.** 924 **D.** 72

70. *Which expression is *not* equivalent to ${}_3C_2$?

A. $\frac{3!}{2!(3-2)!}$ **B.** $\frac{{}_3P_2}{2!}$ **C.** ${}_3C_1$ **D.** $\binom{2}{3}$

71. *What is the value of the 6th number in row 11 of Pascal's triangle?

A. ${}_{10}C_5$ **B.** ${}_{12}C_7$ **C.** ${}_{11}C_6$ **D.** ${}_5C_{10}$

72. *What are the first three terms in the expansion of $(x+8)^{11}$?

A. $x^{11}+8x^{10}+64x^9$
B. $x^{11}+11x^{10}+55x^9$
C. $x^{11}+88x^{10}+3520x^9$
D. $x^{11}+80x^{10}+2880x^9$

Problem

1. For what values of k does the equation $125^x = 25^{(x^2+k)}$ have no real solution?

$5^{3x} = 5^{2x^2+2k} \rightarrow 3x = 2x^2+2k$

$0 = 2x^2 - 3x + 2k \rightarrow b^2 - 4ac < 0$

$(-3)^2 - 4(2)(2k) < 0$

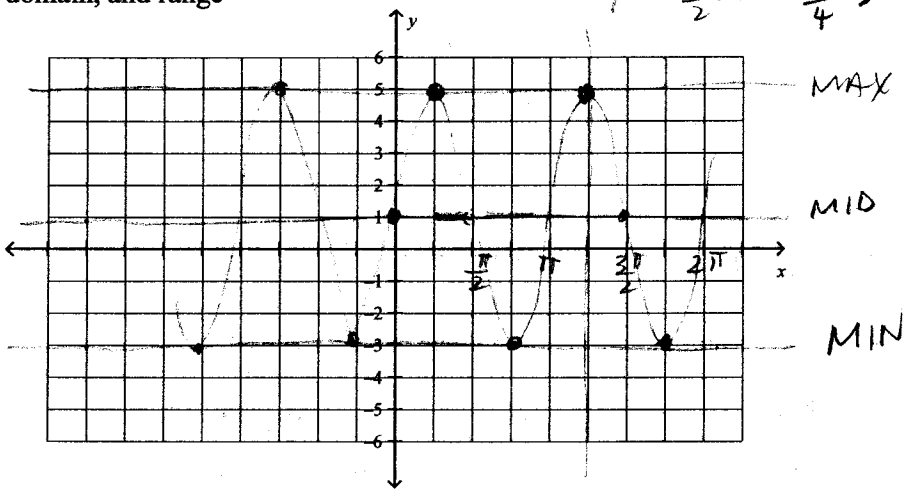
$9 - 16k < 0$

$k > 9/16$

2. Sketch the graph of $y = 4\cos 2\left(x - \frac{\pi}{4}\right) + 1$.

Describe these characteristics of the function: amplitude, period, phase shift, equation of the centre line, domain, and range

$4 \quad \frac{2\pi}{2} = \pi \quad \frac{\pi}{4} \rightarrow \quad y = 1$



3. Prove the identity $\sin^2\theta = 1 + \cot^2\theta\cos^2\theta - \cot^2\theta$.

RS $1 + \cot^2(\cos^2 - 1)$

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

$1 - \cos^2 = \sin^2 = LS$

4. Expand $\left(\frac{1}{4}x + \frac{2}{5}y\right)^5$.

$${}_5C_0\left(\frac{1}{4}x\right)^5 + {}_5C_1\left(\frac{1}{4}x\right)^4\left(\frac{2}{5}y\right) + {}_5C_2\left(\frac{1}{4}x\right)^3\left(\frac{2}{5}y\right)^2 + {}_5C_3\left(\frac{1}{4}x\right)^2\left(\frac{2}{5}y\right)^3 + {}_5C_4\left(\frac{1}{4}x\right)\left(\frac{2}{5}y\right)^4 + {}_5C_5\left(\frac{2}{5}y\right)^5$$

$$\frac{1}{1024}x^5 + 5\left(\frac{1}{256}x^4\right)\left(\frac{2}{5}y\right) + 10\left(\frac{1}{64}x^3\right)\left(\frac{4}{25}y^2\right) + 10\left(\frac{1}{16}x^2\right)\left(\frac{8}{125}y^3\right) + 5\left(\frac{1}{4}x\right)\left(\frac{16}{625}y^4\right) + \frac{32}{3125}y^5$$

$$\frac{1}{1024}x^5 + \frac{1}{128}x^4y + \frac{1}{40}x^3y^2 + \frac{1}{25}x^2y^3 + \frac{4}{125}xy^4 + \frac{32}{3125}y^5$$