Level 5: Math Analysis Huddle–2015

1) Solve the inequality: $\frac{x^2(x-10)(x+2)}{(x-5)(x+8)} \geq 0$

A) $(-\infty, -8) \cup [-2, 0) \cup (0, 5) \cup [10, \infty)$

B) $(-\infty, -8) \cup [-2, 5) \cup [10, \infty)$

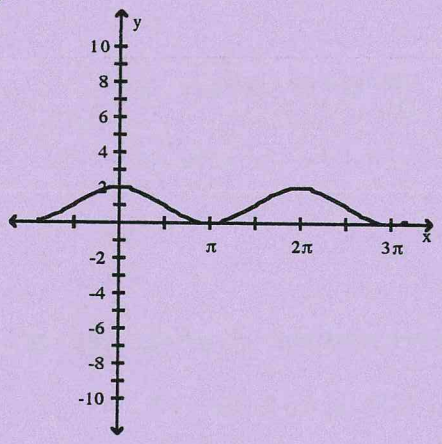
C) $(-\infty, -8) \cup [10, \infty)$

D) $(-8, -2] \cup (5, 10]$

E) None of these

2) Use transformations to graph the function: $y = 2\cos x + 1$

A)



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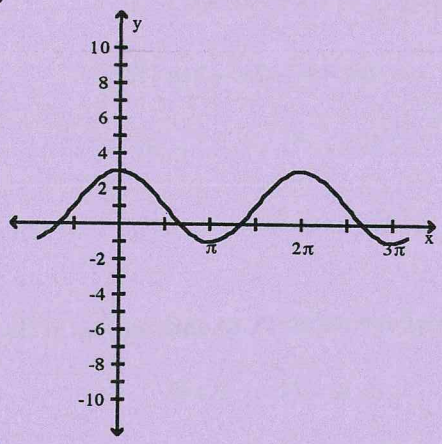

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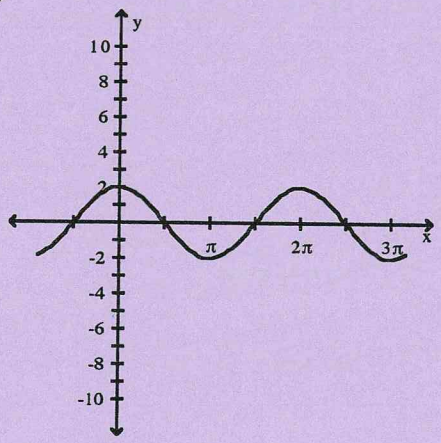

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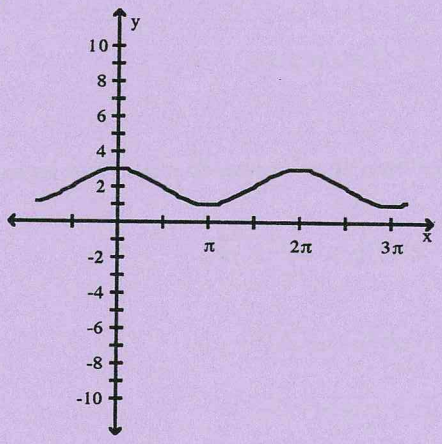


E) None of these

3) Solve the system.

$$\begin{cases} x+2y+3z = 8 \\ x+y+z = 4 \\ -x+y+2z = 10 \end{cases}$$

The inverse of $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 1 \\ -1 & 1 & 2 \end{bmatrix}$ is $\begin{bmatrix} 1 & -1 & -1 \\ -3 & 5 & 2 \\ 2 & -3 & -1 \end{bmatrix}$.

A) $x = -6$, $y = 16$, $z = -6$; $(-6, 16, -6)$

B) $x = 8$, $y = 16$, $z = -20$; $(8, 16, -20)$

C) $x = 22$, $y = 64$, $z = 38$; $(22, 64, 38)$

D) $x = 16$, $y = -18$, $z = -10$; $(16, -18, -10)$

E) None of these

4) Form a polynomial f(x) with real coefficients having the given degree and zeros:
Degree: 3; zeros: –4 and 3 – 2i

A) $f(x) = x^3 - 2x^2 - 11x + 52$

B) $f(x) = x^3 - 2x^2 + 5x - 52$

C) $f(x) = x^3 - x^2 - 11x + 52$

D) $f(x) = x^3 - x^2 + 11x + 52$

E) None of these

5) Find the center (h, k) and radius r of the circle with the given equation.: $x^2 + y^2 + 2x + 10y + 26 = 49$

A) $(h, k) = (1, 5)$; $r = 49$

B) $(h, k) = (-1, -5)$; $r = 7$

C) $(h, k) = (5, 1)$; $r = 49$

D) $(h, k) = (-5, -1)$; $r = 7$

E) None of these

6) The function f is one–to–one. Find its inverse: $f(x) = (x + 2)^3 - 8$.

A) $f^{-1}(x) = \sqrt[3]{x + 10}$

B) $f^{-1}(x) = \sqrt[3]{x + 6}$

C) $f^{-1}(x) = \sqrt[3]{x - 8} + 2$

D) $f^{-1}(x) = \sqrt[3]{x - 2} + 8$

E) None of these

7) Which of the following is <u>NOT</u> a zero of $f(x) = x^3 + 7x^2 - 16x + 18$?

A) $1 - i$

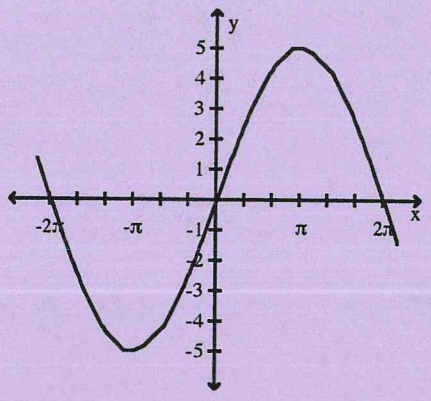
B) -9

C) 9

D) $1 + i$

E) None of these

8) **Find an equation for the following graph of sine.**



A) $y = 2\sin\left(\frac{1}{5}x\right)$ B) $y = 2\sin(5x)$ C) $y = 5\sin\left(\frac{1}{2}x\right)$ D) $y = 5\sin(2x)$

E) None of these

9) **Solve the equation on the interval $0 \le \theta < 2\pi$: $3\cos\theta + 3 = 2\sin^2\theta$**

A) $\left\{\frac{2\pi}{3}, \pi, \frac{4\pi}{3}\right\}$ B) $\left\{\frac{\pi}{4}\right\}$ C) $\left\{\frac{2\pi}{3}, \pi\right\}$ D) $\left\{\frac{\pi}{6}, \pi, \frac{\pi}{3}\right\}$

E) None of these

10) **Find the vertical asymptotes of the rational function: $f(x) = \frac{-x^2+16}{x^2+5x+4}$**

A) $x = 1, x = -4$ B) $x = -1, x = 4$ C) $x = -1, x = -4$ D) $x = -1$

E) None of these

11) **Find the exact value of the expression: $\tan\left(-\frac{37\pi}{4}\right)$**

A) $\frac{2\sqrt{3}}{3}$ B) -1 C) 0 D) 1

E) None of these

12) **Find an equation of the secant line containing (1, f(1)) and (2, f(2)): $f(x) = x^3 - x$**

A) $y = 6x - 6$ B) $y = -6x - 6$ C) $y = 6x + 6$ D) $y = -6x + 6$

E) None of these

13) **Solve the equation: $\ln\sqrt{x+5} = 3$.**

A) $\left\{\frac{e^3}{2} + 5\right\}$ B) $\left\{\frac{e^3}{2} - 5\right\}$ C) $\{e^6 + 5\}$ D) $\{e^6 - 3\}$

E) None of these

14) **Write the equation of a sine function that has the given characteristics: Amplitude: 4; Period: 3**

A) $y = \sin(3\pi x) + 4$ B) $y = 4\sin\left(\frac{2}{3}\pi x\right)$ C) $y = 3\sin\left(\frac{1}{2}\pi x\right)$ D) $y = 4\sin(3x)$

E) None of these

15) **Solve the equation: $3 \cdot 5^{2t-1} = 75$.**

A) {3} B) $\left\{\frac{3}{2}\right\}$ C) $\left\{\frac{13}{10}\right\}$ D) $\left\{\frac{1}{2}\right\}$

E) None of these

16) **Use the Binomial Theorem to find the coefficient of the x term in the expansion of $(2x+3)^3$.**

A) 108x B) 9 C) 36x D) 54x

E) None of these

17) **For the given functions f and g, find $f \cdot g$ and state its domain: $f(x) = \sqrt{9-x}$; $g(x) = \sqrt{x-4}$**

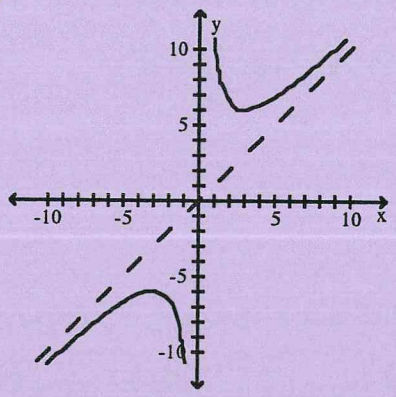
A) $(f \cdot g)(x) = \sqrt{(9-x)(x-4)}$; $\{x \mid x \geq 0\}$ B) $(f \cdot g)(x) = \sqrt{(9-x)(x-4)}$; $\{x \mid 4 \leq x \leq 9\}$

C) $(f \cdot g)(x) = \sqrt{(9-x)(x-4)}$; $\{x \mid x \neq 4, x \neq 9\}$ D) $(f \cdot g)(x) = \sqrt{-x^2 - 36}$; $\{x \mid x \neq 36\}$

E) None of these

18) **Graph the function:** $f(x) = x + \frac{9}{x}$

A)



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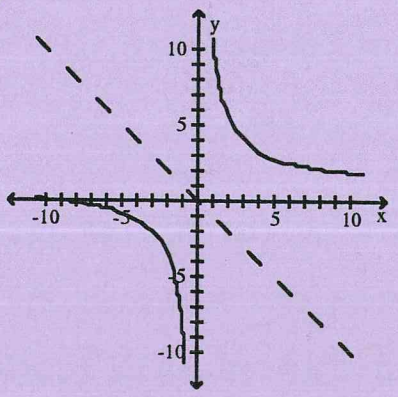

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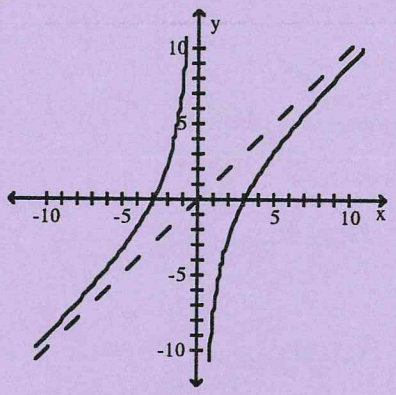
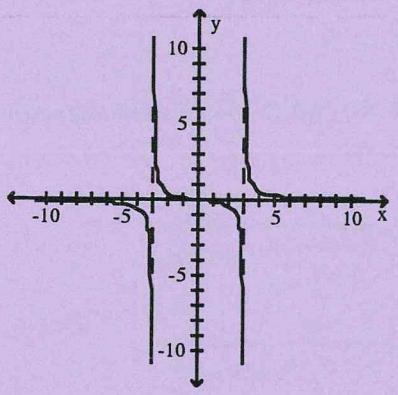


D)



E) None of these

19) **Solve the system of equations:**

$$\begin{cases} y = -x^2 + 13 \\ x^2 + y^2 = 25 \end{cases}$$

A) (3, 4), (-3, 4)

B) (9, 94), (16, 269)

C) (4, -3), (3, 4), (-3, 4), (-4, -3)

D) (4, -3), (-4, -3)

E) None of these

20) **Find the equation of a circle in standard form with center at the point (–3, 2) and tangent to the line y = 4.**

A) $(x-3)^2+(y+2)^2=16$

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

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

D) $(x+3)^2+(y-2)^2=16$

E) None of these

21) **Find the foci of the ellipse.:** $4x^2+y^2-8x+4y+4=0$.

A) foci at $(1,-2-\sqrt{3}),(1,-2+\sqrt{3})$

B) foci at $(4,-2-2\sqrt{5}),(4,-2+2\sqrt{5})$

C) foci at $(-1,-2-\sqrt{3}),(-1,-2+\sqrt{3})$

D) foci at $(-2,3-2\sqrt{5}),(-2,3+2\sqrt{5})$

E) None of these

22) **Write the partial fraction decomposition of the rational expression:** $\dfrac{x+3}{x^3-2x^2+x}$.

A) $\dfrac{3}{x}+\dfrac{4}{x-1}+\dfrac{-3}{(x-1)^2}$

B) $\dfrac{-3}{x}+\dfrac{3}{x-1}+\dfrac{4}{(x-1)^2}$

C) $\dfrac{3}{x}+\dfrac{-3}{x-1}+\dfrac{7}{(x-1)^2}$

D) $\dfrac{3}{x}+\dfrac{-3}{x-1}+\dfrac{4}{(x-1)^2}$

E) None of these

23) **Find** $\|v\|-\|w\|$: $v=2i-3j+6k$ **and** $w=5i+3j-k$

A) $5\sqrt{2}-7$

B) $7-\sqrt{5}$

C) $7-\sqrt{35}$

D) $7\sqrt{2}$

E) None of these

24) **Use the given zero to find the remaining zeros of the function:** $f(x)=x^3+2x^2+5x-26$; **zero:** $-2+3i$

A) $3-2i, 2$

B) $3-2i, -2$

C) $-2-3i, 2$

D) $-2-3i, -2$

E) None of these

25) **Solve the equation:** $2 + \log_3 (2x + 5) - \log_3 x = 4$

A) $\left\{\frac{1 \pm \sqrt{46}}{9}\right\}$ B) $\left\{\frac{1 + \sqrt{46}}{9}\right\}$ C) $\left\{\frac{5}{4}\right\}$ D) $\left\{\frac{5}{7}\right\}$

E) None of these

26) **Determine whether the infinite geometric series converges or diverges. If it converges, find its sum.**

$$\sum_{k=1}^{\infty} 2\left(\frac{2}{3}\right)^{k-1}$$

A) Converges; 4 B) Converges; 8 C) Converges; 6 D) Diverges

E) None of these

27) **Given that** $\sin\theta = \frac{1}{3}$ **and** $\cos\theta < 0$**, find the exact value of** $\sec\theta$**.**

A) $\frac{3\sqrt{2}}{4}$ B) 3 C) $\frac{\sqrt{6}}{4}$ D) $-\frac{3\sqrt{2}}{4}$

E) None of these

28) **Find the exact value of:** $\tan\left[\cos^{-1}\left(-\frac{1}{3}\right)\right]$

A) $2\sqrt{2}$ B) $\frac{2\sqrt{2}}{3}$ C) $-\frac{2\sqrt{2}}{3}$ D) $-2\sqrt{2}$

E) None of these

29) **Find an equation for the hyperbola described: Vertices at (0, ±2); foci at (0, ±3).**

A) $\frac{y^2}{4} - \frac{x^2}{9} = 1$ B) $\frac{y^2}{9} - \frac{x^2}{4} = 1$ C) $\frac{y^2}{5} - \frac{x^2}{4} = 1$ D) $\frac{y^2}{4} - \frac{x^2}{5} = 1$

E) None of these

30) **Solve the equation:** $3\sin^{-1}x = \pi$.

A) $\frac{\sqrt{2}}{3}$ B) $\frac{3\sqrt{3}}{2}$ C) $\frac{\sqrt{3}}{2}$ D) $\frac{\sqrt{3}}{3}$

E) None of these