

Name _____

Period# _____

Pre-Calculus: Midterm Review

1. Find all real solutions of the equation

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

- a. $x=0, 3, 2$
- b. $x=6, -1$
- c. $x=0, 3, -2$
- d. $x=0, -6, 1$

2. Solve by completing the square

$$x^2 + 6x - 16 = 0$$

- a. $x=2, -8$
- b. $x=-2, 8$
- c. $x=2, 8$
- d. $x=-2, -8$

3. Factor $27x^3 + 8$

- a. $(3x+2)^3$
- b. $(3x+2)(9x^2 + 6x + 4)$
- c. $(3x+2)(3x^2 - 6x + 2)$
- d. $(3x+2)(9x^2 - 6x + 4)$

4. Solve the quadratic equation $3x^2 + 5x = 4$

- a. $\frac{5 \pm \sqrt{13}}{2}$
- b. $\frac{5 \pm \sqrt{73}}{6}$
- c. $\frac{-5 \pm \sqrt{73}}{6}$
- d. $\frac{-5 \pm \sqrt{23}}{6}$

5. Simplify $\frac{5x^3y^7z^{-8}}{(x^2y^{-2}z)^2}$

- a. $\frac{5y^5}{x^2z^6}$
- b. $\frac{5y^{11}}{xz^{10}}$
- c. $\frac{5xy^{11}}{z^{10}}$
- d. $\frac{5y^3}{x^3z^8}$

6. Find all the real solutions to the equation

$$\frac{x^2 - 12x - 64}{x + 5} = 0$$

- a. $x=8, -8$
- b. $x=-16, 4$
- c. $x=16, -4$
- d. $x=8, 5$

7. Find the average rate of change of the function

$$f(x) = x^2 + 2x \text{ from } x=-1 \text{ to } x=4.$$

**Recall $\frac{f(b) - f(a)}{b - a}$

- a. 5
- b. -1
- c. 4
- d. 12

8. Compute the difference quotient of

$$3x^2 + 2x - 1$$

**Recall $\frac{f(x+h) - f(x)}{h}$

- a. $6x+h+2$
- b. $2x+3h+1$
- c. $x+h+2$
- d. $6x+3h+2$

9. Simplify and Multiply $\frac{x^2 + 3x}{x + 2} \div \frac{x^2 + x - 6}{x^2 - 4}$

- a. $x + 3$
- b. $\frac{x + 2}{x + 3}$
- c. $\frac{1}{x}$
- d. x

**Questions #10-13, refer to the function

$$f(x) = \frac{3x + 12}{x^2 + 3x + 2}$$

10. Find the x-intercept(s)

- a. $x = -4$
- b. $x = -2, -1$
- c. $y = 0$
- d. none

11. Find the vertical asymptotes

- a. $x = -4$
- b. $x = -2, -1$
- c. $y = 0$
- d. none

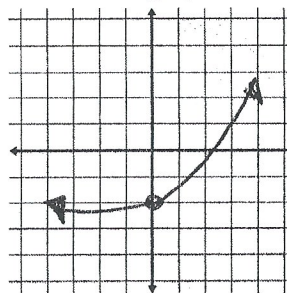
12. Find the horizontal asymptotes

- a. $x = -4$
- b. $x = -2, -1$
- c. $y = 0$
- d. none

13. The function has a hole at

- a. $x = -4$
- b. $x = -2, -1$
- c. $y = 0$
- d. none

14. Match the graph with the correct function.



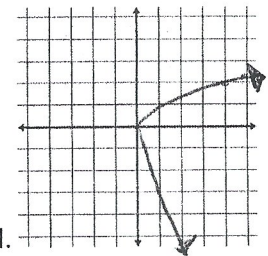
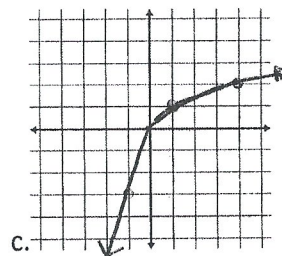
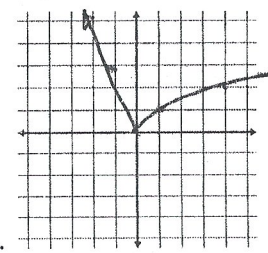
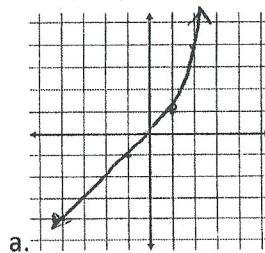
- a. $f(x) = -2^x - 3$
- b. $f(x) = 2^{-x} - 3$
- c. $f(x) = 2^x - 3$
- d. $f(x) = 2^x + 3$

15. Determine the left and right behavior of the graph $y = 5x^3 + 4x^2 - x + 2$

- (a) Up to the left, down to the right
- (b) Down to the left, up to the right
- (c) Up to the left, up to the right
- (d) Down to the left, down to the right

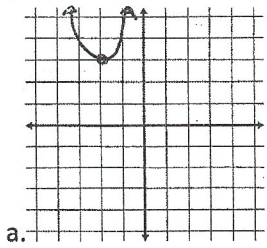
16. Sketch the graph of the piecewise function.

$$f(x) = \begin{cases} \sqrt{x} & x \geq 0 \\ 3x & x < 0 \end{cases}$$

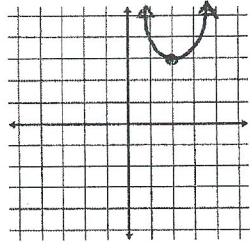


17. Match the correct graph with the function

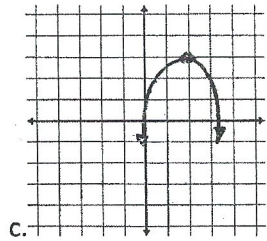
$$f(x) = 2(x-2)^2 + 3$$



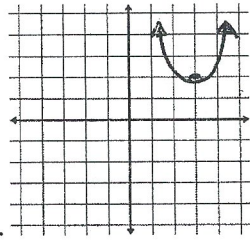
a.



b.



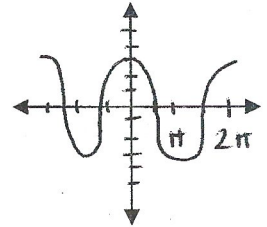
c.



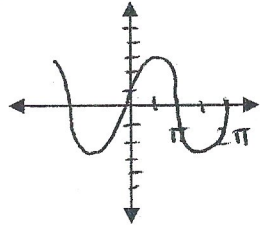
d.

18. Graph $f(x) = 3 + \sin x$

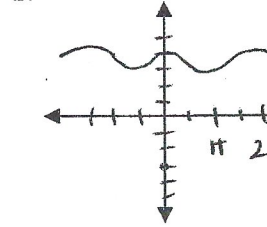
a.



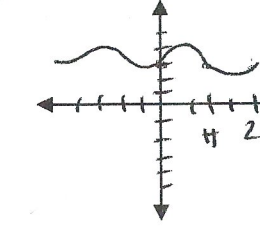
c.



b.



d.



19. Factor: $P(x) = x^4 - x^3 - 13x^2 + x + 12$

- (a) $(x+1)(x-1)(x-3)(x-4)$
- (b) $(x+1)(x+1)(x+3)(x+4)$
- (c) $(x+1)(x-1)(x+3)(x-4)$
- (d) $(x+1)(x-1)(x-3)(x+4)$

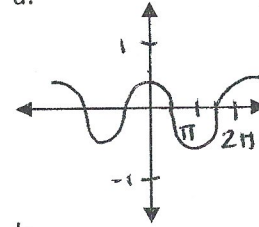
20. Find the domain. (Write as an interval)

$$\frac{1}{x^2 + x}$$

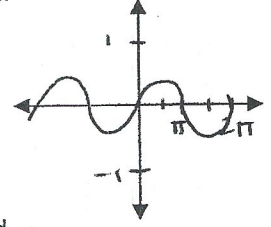
- a. $(-\infty, -1) \cup (-1, \infty)$
- b. $(-\infty, 1) \cup (1, \infty)$
- c. $(-\infty, -1) \cup (-1, 0) \cup (0, \infty)$
- d. $(-\infty, -1) \cup (0, \infty)$

21. Graph $f(x) = -\frac{1}{3} \cos x$

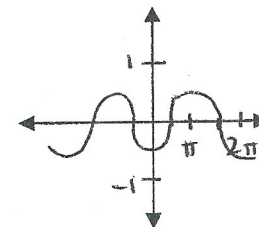
a.



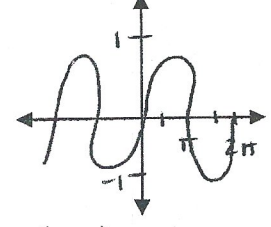
c.



b.



d.



22. Find the exact value of $\csc\left(\frac{-\pi}{6}\right)$

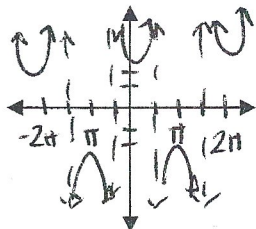
- a. 2
- b. $\frac{2\sqrt{3}}{3}$
- c. -2
- d. $-\sqrt{3}$

23. Evaluate: $\cot 30^\circ$

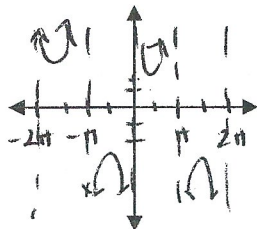
- a. 2
- b. $-\frac{2\sqrt{3}}{3}$
- c. -2
- d. $\sqrt{3}$

24. Graph $y = 2 \sec\left(x - \frac{\pi}{2}\right)$

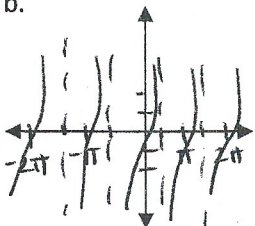
a.



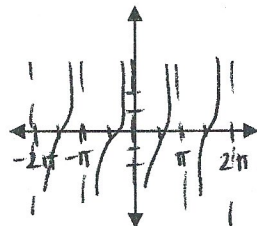
b.



b.

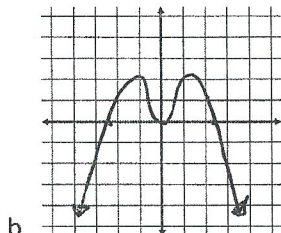
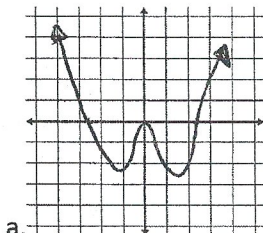


d.



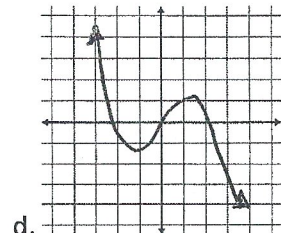
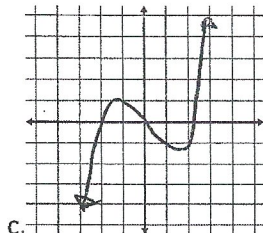
25. Match the polynomial with one of the graphs.

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



a.

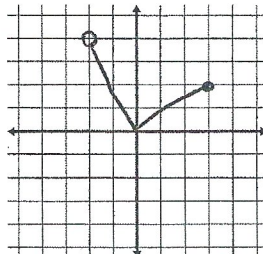
b.



c.

d.

26. Determine the interval on which the function is increasing.



a. Dec: $[-2, 0]$; Inc: $[0, 3]$

b. Dec: $[-2, 0]$; Inc: $(0, 3]$

c. Dec: $(-2, 0)$; Inc: $[0, 3]$

d. Dec: $(-2, 0)$; Inc: $(0, 3]$

27. Using your calculator in degree mode, find $\sin 36^\circ$

a. 0.8936

b. 0.5879

c. 0.2681

d. 0.9982

28. Using your calculator in degree mode, find $\tan 31^\circ$

a. 0.9826

b. 0.1612

c. 0.3545

d. 0.6001

29. Expand $(2x^2 + x - 5)(2x - 3)$

a. $4x^3 - 4x^2 - 13x - 15$

b. $4x^3 + 4x^2 - 13x - 15$

c. $4x^3 - 4x^2 - 13x + 15$

d. $4x^3 + 4x^2 - 13x + 15$

30. Find the amplitude, period and phase shift of

$y = 3 \cos 2\left(x - \frac{\pi}{6}\right)$

a. amp= 3

period= π

phase shift= $\frac{\pi}{6}$

b. amp= -3

period= π

phase shift= $\frac{\pi}{6}$

c. amp= 3

period= 2π

phase shift= $-\frac{\pi}{6}$

d. amp= 3

period= 2π

phase shift= $\frac{\pi}{6}$

31. Find all real solutions of the equation

$$3|x+2|-4 < 8$$

- a. $x > 2$ or $x < -6$
- b. $-6 < x < 2$
- c. $x > 2$ or $x < -10$
- d. $-10 < x < 2$

32. Simplify i^{35}

- (a) 1
- (b) -1
- (c) $-i$
- (d) i

33. Write in standard form: $3 - \sqrt{-20}$

- (a) $3 - i\sqrt{5}$
- (b) $3 - 2i\sqrt{5}$
- (c) $5i$
- (d) $3 + 2i\sqrt{5}$

34. Which of the following fourth degree polynomial has zeros $3, -2, i$?

- (a) $x^4 + x^3 + 5x^2 + x + 6$
- (b) $x^4 - x^3 - 5x^2 - x - 6$
- (c) $x^4 - x^3 + 5x^2 - x - 6$
- (d) $x^4 + x^3 - 5x^2 + x - 6$

35. Factor completely: $x^3 + 4x^2 + x + 4$

- (a) $(x+4)(x-i)(x-i)$
- (b) $(x-4)(x+i)(x+i)$
- (c) $(x-4)(x-i)(x+i)$
- (d) $(x+4)(x-i)(x+i)$

36. Given $f(x) = x^2$ and $g(x) = x + 5$.

Find $(g \circ f)(x)$

- a. $x^2 + 5x$
- b. $5x$
- c. $x^2 + 5$
- d. $(x+5)^2$

37. Given $f(x) = \frac{x-2}{x+5}$. Find $f^{-1}(x)$.

- a. $\frac{3x-2}{x+1}$
- b. $\frac{4x-9}{x-1}$
- c. $\frac{-5x-2}{x-1}$
- d. $5x-3$

38. If $f(x) = x^3 + 4x^2 + 10x + 12$ has a zero at -2 , find the other zeros.

- (a) $-1 \pm i\sqrt{5}$
- (b) $-2 \pm 2i\sqrt{5}$
- (c) $\frac{-1 \pm i\sqrt{10}}{2}$
- (d) $\frac{-1 \pm 2i\sqrt{5}}{2}$

39. Simplify and Multiply $\frac{x^2+3x}{x+2} \cdot \frac{x^2-4}{x^2+x-6}$

- a. $x+3$
- b. $\frac{x+2}{x+3}$
- c. $\frac{1}{x}$
- d. x

40. Simplify $\frac{3x^5}{12x^7}$

- a. $4x^2$
- b. $\frac{1}{4x^2}$
- c. $\frac{1}{3x}$
- d. $\frac{1}{4x}$

41. $\frac{25x^{-5}}{24y^3} \div \frac{10x^{-2}}{16y^{-4}}$

a. $\frac{5}{3x^3y^7}$

b. $\frac{8x^2}{3y^5}$

c. $\frac{2}{3x^2y^{10}}$

d. $\frac{3}{5x^3y^7}$

42. $\log_x 16 = 4$

a. 8

b. 4

c. 2

d. 1

43. Solve $5e^{2x} = 12$

a. 0.5422

b. 0.8366

c. 5.2369

d. 0.4377

44. $2\log_3 5x + 5\log_3 2x - 2\log_3 x$

a. $\log_3 650x^5$

b. $\log_3 25x^2$

c. $\log_3 800x^5$

d. $\log_3 100x$

45. Evaluate $\log_3 15$

a. 2

b. 3

c. 2.47

d. 4.5

46. Given the sets

$A = \{3, 5, 7, 9\}$

$B = \{4, 6, 8, 10\}$

$C = \{8, 9, 10, 11\}$

Find $A \cap B \cap C$

a. $\{7, 8, 9, 10\}$

b. $\{8, 9, 10\}$

c. $\{10\}$

d. $\{\emptyset\}$

47. Solve: $x^2 + 2x + 2 = 0$

a. $-1 \pm i$

b. $2 \pm 2i$

c. $-2 \pm i$

d. $-1 \pm 2i$

48. Find all the rational zeros of

$P(x) = x^3 + 3x^2 - 6x - 8$

a. 1, 4, 2

b. -1, -4, 2

c. -1, -4, -2

d. 1, 4, -2

49. Find the quotient and remainder of

$$\frac{2x^3 - 10x^2 - 9x + 3}{x - 2}$$

a. $2x^2 - 6x - 21 + \frac{-39}{x-2}$

b. $2x^2 + 6x - 25 + \frac{-30}{x-2}$

c. $2x^2 + x - 21 + \frac{-15}{x-2}$

d. $2x^2 + 3x - 16 + \frac{-26}{x-2}$

50. Simplify and Add $\frac{x+2}{x+5} + \frac{3}{x^2+7x+10}$

a. $\frac{x+5}{x^2+7x+10}$

b. $\frac{x^2+x+5}{x^2+7x+10}$

c. $\frac{x^2+4x+7}{x^2+7x+10}$

d. $\frac{2x+5}{x^2+7x+10}$

Name _____
 Period# _____

Answer Key (1)

Pre-Calculus: Midterm Review

1. Find all real solutions of the equation

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

a. $x=0, 3, 2$

b. $x=6, -1$

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

d. $x=0, -6, 1$

$$x(x^2 - x - 6) = 0$$

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

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

2. Solve by completing the square

$$x^2 + 6x - 16 = 0$$

a. $x=2, -8$

b. $x=-2, 8$

c. $x=2, 8$

d. $x=-2, -8$

$$x^2 + 6x - 16 = 0$$

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

$$x = -3, 2$$

3. Factor $27x^3 + 8$

a. $(3x+2)^3$

b. $(3x+2)(9x^2 + 6x + 4)$

c. $(3x+2)(3x^2 - 6x + 2)$

d. $(3x+2)(9x^2 - 6x + 4)$

$$(3x+2)(9x^2 - 6x + 4)$$

4. Solve the quadratic equation $3x^2 + 5x = 4$

a. $\frac{5 \pm \sqrt{13}}{2}$

b. $\frac{5 \pm \sqrt{73}}{6}$

c. $\frac{-5 \pm \sqrt{73}}{6}$

d. $\frac{-5 \pm \sqrt{23}}{6}$

$$3x^2 + 5x - 4 = 0$$

$$\frac{-5 \pm \sqrt{25 - 4(3)(-4)}}{2(3)}$$

$$\frac{-5 \pm \sqrt{25 + 48}}{6}$$

$$\frac{-5 \pm \sqrt{73}}{6}$$

5. Simplify $\frac{5x^3y^7z^{-8}}{(x^2y^{-2}z)^2}$

a. $\frac{5y^5}{x^2z^6}$

b. $\frac{5y^{11}}{xz^{10}}$

c. $\frac{5xy^{11}}{z^{10}}$

d. $\frac{5y^3}{x^3z^8}$

$$\frac{5x^3y^7z^{-8}}{x^4y^{-4}z^2}$$

$$\frac{5y^{11}}{xz^{10}}$$

6. Find all the real solutions to the equation

$$\frac{x^2 - 12x - 64}{x+5} = 0$$

a. $x=8, -8$

b. $x=-16, 4$

c. $x=16, -4$

d. $x=8, 5$

$$(x-16)(x+4) = 0$$

just top = 0
 $x = 16 \quad x = -4$

7. Find the average rate of change of the function

$$f(x) = x^2 + 2x \text{ from } x=-1 \text{ to } x=4.$$

**Recall $\frac{f(b) - f(a)}{b - a} = \frac{f(4) - f(-1)}{4 - (-1)}$

a. 5
 b. -1
 c. 4
 d. 12

$$\frac{f(4) - f(-1)}{4 - (-1)} = \frac{24 + 1 - (-1 - 2)}{5} = \frac{25}{5} = 5$$

8. Compute the difference quotient of

$$3x^2 + 2x - 1$$

**Recall $\frac{f(x+h) - f(x)}{h}$

a. $6x+h+2$

b. $2x+3h+1$

c. $x+h+2$

d. $6x+3h+2$

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

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

$$= 3(x^2 + 2xh + h^2) + 2x + 2h - 1$$

$$= 3x^2 + 6xh + 3h^2 + 2x + 2h - 1$$

9. Simplify and Multiply $\frac{x^2 + 3x}{x+2} \div \frac{x^2 + x - 6}{x^2 - 4}$

~~10/2~~
3/1

- a. $x+3$
- b. $\frac{x+2}{x+3}$

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

x

- c. $\frac{1}{x}$
- d. x

**Questions #10-13, refer to the function

$$f(x) = \frac{3x+12}{x^2+3x+2} \cdot \frac{3(x+4)}{(x+2)(x+1)}$$

10. Find the x-intercept(s)

- a. $x=-4$
- b. $x=-2, -1$
- c. $y=0$
- d. none

top = 0
 $3x+12=0$
 $3x = -12$
 $\frac{3x}{3} = \frac{-12}{3}$
 $x = -4$

11. Find the vertical asymptotes

- a. $x=-4$
- b. $x=-2, -1$
- c. $y=0$
- d. none

bottom = 0
 $(x+2)(x+1)=0$
 $x = -2, x = -1$

12. Find the horizontal asymptotes

- a. $x=-4$
- b. $x=-2, -1$
- c. $y=0$
- d. none

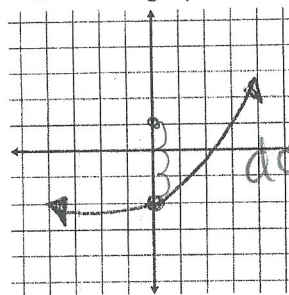
biggest exponent
 $y = \frac{0x^2}{1x^2} = 0$

13. The function has a hole at

- a. $x=-4$
- b. $x=-2, -1$
- c. $y=0$
- d. none

no common factors

14. Match the graph with the correct function.



down 3
no reflection

- a. $f(x) = -2^x - 3$
- b. $f(x) = 2^{-x} - 3$
- c. $f(x) = 2^x - 3$
- d. $f(x) = 2^x + 3$

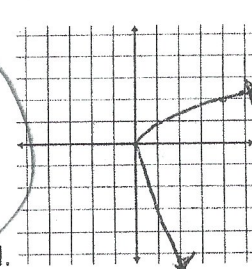
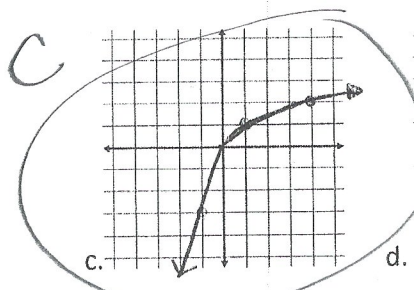
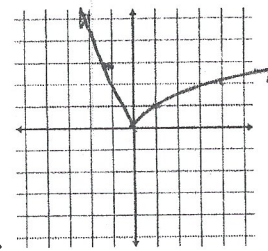
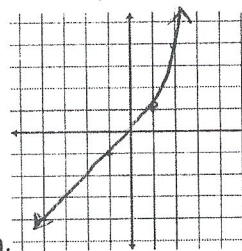
15. Determine the left and right behavior of the graph $y = 5x^3 + 4x^2 - x + 2$

- (a) Up to the left, down to the right
- (b) Down to the left, up to the right
- (c) Up to the left, up to the right
- (d) Down to the left, down to the right

up R
down L

16. Sketch the graph of the piecewise function.

$$f(x) = \begin{cases} \sqrt{x} & x \geq 0 \\ 3x & x < 0 \end{cases}$$



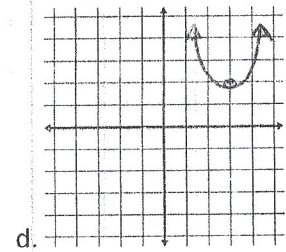
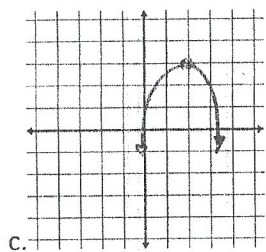
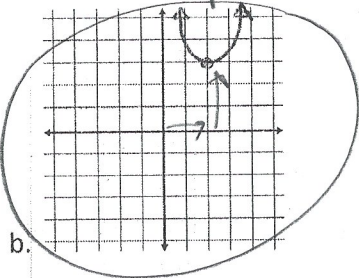
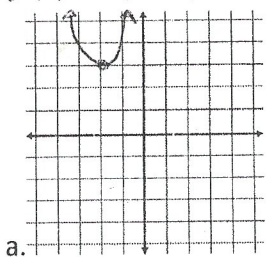
x	y	x	y
0	0	0	0
1	1	-1	-3
4	2	-2	-6

17. Match the correct graph with the function

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

right 2 up 3 ↗

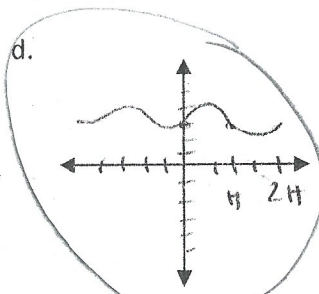
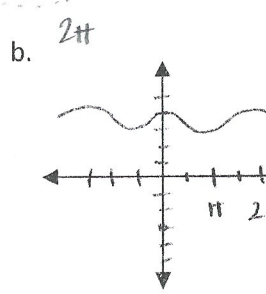
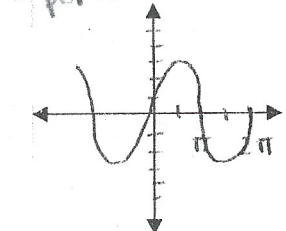
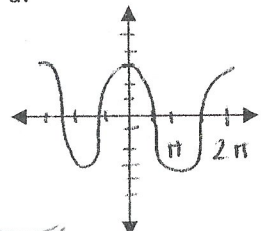
B



18. Graph $f(x) = 3 + \sin x$

amp = 1
period = 2π up 3

D



19. Factor: $P(x) = x^4 - x^3 - 13x^2 + x + 12$

- (a) $(x+1)(x-1)(x-3)(x+4)$ last -12
- (b) $(x+1)(x+1)(x+3)(x+4)$ 12
- (c) $(x+1)(x-1)(x+3)(x-4)$ 12
- (d) $(x+1)(x-1)(x-3)(x+4)$ 12

C

$$\begin{array}{r} 1 \mid 1 \quad -1 \quad -13 \quad 1 \quad 12 \\ \quad 1 \quad 0 \quad -13 \quad -12 \\ \hline 1 \quad 0 \quad -13 \quad -12 \quad 0 \end{array}$$

$$\begin{array}{r} 3 \mid 1 \quad -1 \quad -13 \quad 1 \quad 12 \\ \quad 3 \quad 0 \quad -21 \quad 12 \\ \hline 1 \quad 2 \quad -7 \quad 12 \quad 0 \end{array}$$

$$\begin{array}{r} 3 \mid 1 \quad -1 \quad -13 \quad 1 \quad 12 \\ \quad -3 \quad 3 \quad 12 \quad 3 \quad -12 \\ \hline 1 \quad -4 \quad -1 \quad 4 \quad 0 \end{array}$$

20. Find the domain. (Write as an interval)

$$\frac{1}{x^2 + x}$$

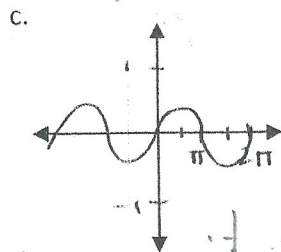
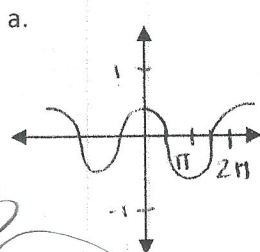
$$\begin{aligned} x^2 + x &= 0 \\ x(x+1) &= 0 \\ x &\neq 0 \quad x \neq -1 \end{aligned}$$

C

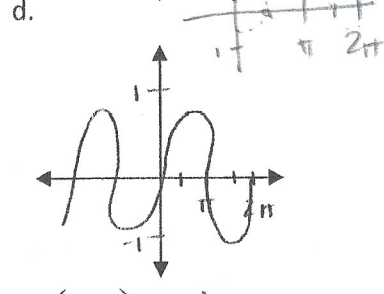
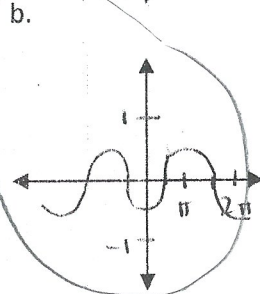
- a. $(-\infty, -1) \cup (-1, \infty)$
- b. $(-\infty, 1) \cup (1, \infty)$
- c. $(-\infty, -1) \cup (-1, 0) \cup (0, \infty)$
- d. $(-\infty, -1) \cup (0, \infty)$

21. Graph $f(x) = -\frac{1}{3} \cos x$

amp = $\frac{1}{3}$ flip
period = 2π



B



22. Find the exact value of $\csc\left(\frac{-\pi}{6}\right) = \frac{1}{y}$

- a. 2
- b. $\frac{2\sqrt{3}}{3}$
- c. -2
- d. $-\sqrt{3}$

$$\begin{aligned} \frac{2\pi - \pi}{6} &= \frac{\pi}{6} \\ \frac{12\pi - \pi}{6} &= \frac{11\pi}{6} \left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right) \\ \frac{1}{y} &= \frac{1}{-\frac{1}{2}} = 1 \cdot \frac{-2}{1} = \boxed{-2} \end{aligned}$$

23. Evaluate: $\cot 30^\circ = \frac{x}{y}$

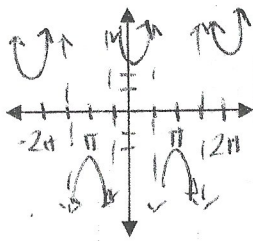
- a. 2
- b. $-\frac{2\sqrt{3}}{3}$
- c. -2
- d. $\sqrt{3}$

D

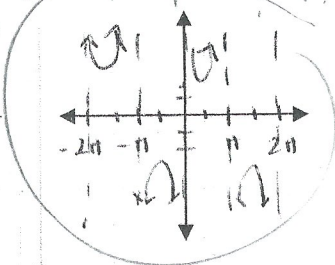
$$\begin{aligned} 30^\circ &= \frac{\pi}{6} \\ \cot\left(\frac{\pi}{6}\right) &= \left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right) \\ \frac{\sqrt{3}}{2} &= \frac{\sqrt{3}}{2} \cdot \frac{2}{1} = \boxed{\sqrt{3}} \end{aligned}$$

24. Graph $y = 2 \sec\left(x - \frac{\pi}{2}\right)$

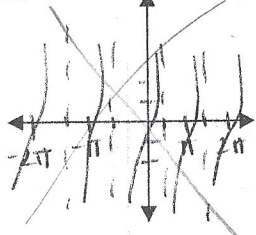
a.



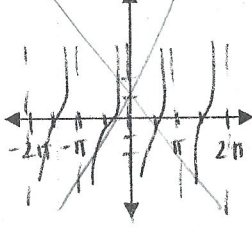
b.



b.

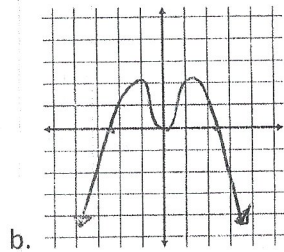
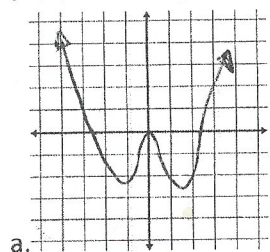


d.



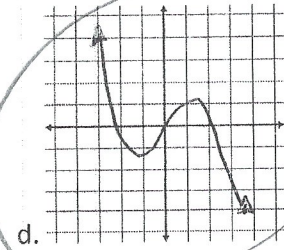
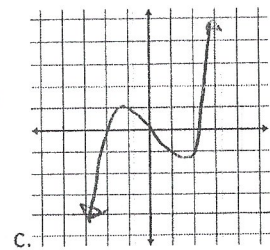
25. Match the polynomial with one of the graphs.

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



a.

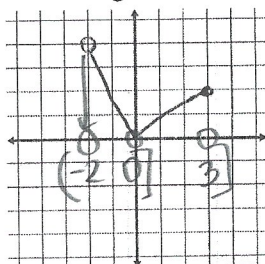
b.



c.

d.

26. Determine the interval on which the function is increasing.



a. Inc(-2,0], Dec[0,3]

b. Inc[-2,0), Dec(0,3]

c. Inc(-2,0), Dec[0,3]

d. Inc(-2,0], Dec(0,3]

Dec Inc

27. Using your calculator in degree mode, find $\sin 36^\circ$

a. 0.8936

b. 0.5879

c. 0.2681

d. 0.9982

B

0.5879

28. Using your calculator in degree mode, find $\tan 31^\circ$

a. 0.9826

b. 0.1612

c. 0.3545

d. 0.6001

D

0.6001

29. Expand $(2x^2 + x - 5)(2x - 3)$

a. $4x^3 - 4x^2 - 13x - 15$

b. $4x^3 + 4x^2 - 13x - 15$

c. $4x^3 - 4x^2 - 13x + 15$

d. $4x^3 + 4x^2 - 13x + 15$

C

$4x^3 - 4x^2 - 13x + 15$

30. Find the amplitude, period and phase shift of

$y = 3 \cos 2\left(x - \frac{\pi}{6}\right)$

a. amp = 3

period = π

phase shift = $\frac{\pi}{6}$

amp = 3
period = $\frac{2\pi}{2} = \pi$
p.s. = $\frac{\pi}{6}$

A

b. amp = -3
period = π

phase shift = $\frac{\pi}{6}$

c. amp = 3

period = 2π

phase shift = $-\frac{\pi}{6}$

d. amp = 3

period = 2π

phase shift = $\frac{\pi}{6}$

31. Find all real solutions of the equation

$$3|x+2|-4 < 8$$

a. $x > 2$ or $x < -6$

b. $-6 < x < 2$

c. $x > 2$ or $x < -10$

d. $-10 < x < 2$

$$3|x+2|-4 < 8$$

$$\frac{3|x+2|}{3} < \frac{12}{3}$$

$$|x+2| < 4$$

$$x+2 < 4 \quad x+2 > -4$$

$$x < 2 \quad x > -6$$

32. Simplify i^{35}

(a) 1

(b) -1

(c) $-i$

(d) i

$$(i^2)^{17} i$$

$$(-1)^{17} i$$

$$-1 \cdot i = -i$$

33. Write in standard form: $3 - \sqrt{-20}$

(a) $3 - i\sqrt{5}$

(b) $3 - 2i\sqrt{5}$

(c) $5i$

(d) $3 + 2i\sqrt{5}$

$$3 - 2i\sqrt{5}$$

34. Which of the following fourth degree polynomial has zeros $3, -2, i$?

(a) $x^4 + x^3 + 5x^2 + x + 6$

(b) $x^4 - x^3 - 5x^2 - x - 6$

(c) $x^4 - x^3 + 5x^2 - x - 6$

(d) $x^4 + x^3 - 5x^2 + x - 6$

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

$$(x^2-x-6)(x^2+1)$$

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

$$x^4 - x^3 - 5x^2 - x - 6$$

35. Factor completely: $x^3 + 4x^2 + x + 4$

(a) $(x+4)(x-i)(x-i)$

(b) $(x-4)(x+i)(x+i)$

(c) $(x-4)(x-i)(x+i)$

(d) $(x+4)(x-i)(x+i)$

$$(x+4)(x^2+1)$$

36. Given $f(x) = x^2$ and $g(x) = x + 5$.

Find $(g \circ f)(x)$

a. $x^2 + 5x$

b. $5x$

c. $x^2 + 5$

d. $(x+5)^2$

$$g(f(x))$$

$$g(x^2)$$

$$x^2 + 5$$

37. Given $f(x) = \frac{x-2}{x+5}$. Find $f^{-1}(x)$.

a. $\frac{3x-2}{x+1}$

b. $\frac{4x-9}{x-1}$

c. $\frac{-5x-2}{x-1}$

d. $5x-3$

$$y = \frac{x-2}{x+5}$$

$$x = \frac{y-2}{y+5}$$

$$y-2 = xy+5x$$

$$-y-5x = -y-5x$$

$$xy-y = -5x-2$$

$$\frac{y(x-1)}{x-1} = \frac{-5x-2}{x-1}$$

38. If $f(x) = x^3 + 4x^2 + 10x + 12$ has a zero at -2 , find the other zeros.

(a) $-1 \pm i\sqrt{5}$

(b) $-2 \pm 2i\sqrt{5}$

(c) $-1 \pm i\sqrt{10}$

(d) $-1 \pm 2i\sqrt{5}$

$$\frac{-2 \mid 4 \mid 10 \mid 12}{-2 \mid -4 \mid -12}$$

$$1 \mid 2 \mid 6 \mid 0$$

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

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

$$\frac{-2 \pm \sqrt{4 - 24}}{2}$$

39. Simplify and Multiply $\frac{x^2+3x}{x+2} \cdot \frac{x^2-4}{x^2+x-6}$

a. $x+3$

b. $\frac{x+2}{x+3}$

c. $\frac{1}{x}$

d. x

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

$$x$$

40. Simplify $\frac{3x^5}{12x^7} \div 3 = \frac{1}{4x^2}$

a. $4x^2$

b. $\frac{1}{4x^2}$

c. $\frac{1}{3x}$

d. $\frac{1}{4x}$

B

41. $\frac{25x^{-5}}{24y^3} \div \frac{10x^{-2}}{16y^{-4}}$

$\frac{25x^{-5}}{24y^3} \cdot \frac{16y^{-4}}{10x^{-2}}$

$\frac{5x^3y^7}{8x^2} \cdot \frac{2x^2}{3y^5}$

$\frac{5x^3y^7}{3x^2y^5}$

a. $\frac{5}{3x^3y^7}$

b. $\frac{8x^2}{3y^5}$

c. $\frac{2}{3x^2y^{10}}$

d. $\frac{3}{5x^3y^7}$

A

46. Given the sets
 $A = \{3, 5, 7, 9\}$
 $B = \{4, 6, 8, 10\}$
 $C = \{8, 9, 10, 11\}$

$n = \text{in common}$
 $U = \text{everything}$

Find $A \cap B \cap C = \text{nothing}$

- a. $\{7, 8, 9, 10\}$
 b. $\{8, 9, 10\}$
 c. $\{10\}$
 d. $\{\emptyset\}$

D

47. Solve: $x^2 + 2x + 2 = 0$ Quadratic

a. $-1 \pm i$ $-2 \pm \sqrt{2^2 - 4(1)(2)}$
 $\frac{-2 \pm \sqrt{4-8}}{2} = \frac{-2 \pm \sqrt{-4}}{2} = \frac{-2 \pm 2i}{2} = -1 \pm i$

b. $2 \pm 2i$

c. $-2 \pm i$

d. $-1 \pm 2i$

A

42. $\log_x 16 = 4$

- a. 8
 b. 4
 c. 2
 d. 1
- $x^4 = 16$
 $x = 2$

C

43. Solve $5e^{2x} = 12$

- a. 0.5422
 b. 0.8366
 c. 5.2369
 d. 0.4377

D

$\frac{5e^{2x}}{5} = \frac{12}{5}$
 $\ln e^{2x} = \ln 2.4$

$\frac{2x}{2} = \frac{0.8755}{2}$

$x = .4377$

44. $2\log_3(5x) + 5\log_3(2x) - 2\log_3 x$

- a. $\log_3 650x^5$
 b. $\log_3 25x^2$
 c. $\log_3 800x^3$
 d. $\log_3 100x$
- $\log_3(5x)^2 + \log_3(2x)^5 - \log_3 x^2$
 $\log_3 25x^2 + \log_3 32x^5 - \log_3 x^2$
 $\frac{\log_3 25x^2 \cdot 32x^5}{x^2} = \log_3 800x^3$

C

45. Evaluate $\log_3 15 = y$

- a. 2
 b. 3
 c. 2.47
 d. 4.5
- $3^y = 15$
 we know

$3^2 = 9$ between 2 and 3
 $3^3 = 27$

50. Simplify and Add $\frac{x+2}{x+5} + \frac{3}{x^2+7x+10}$

a. $\frac{x+5}{x^2+7x+10}$ $\frac{(x+2)(x+2)}{(x+5)(x+2)} \cdot \frac{3}{(x+5)(x+2)}$

b. $\frac{x^2+x+5}{x^2+7x+10}$

c. $\frac{x^2+4x+7}{x^2+7x+10}$

d. $\frac{2x+5}{x^2+7x+10}$

$\frac{10}{5} \cdot \frac{2}{7}$

$\frac{(x+2)(x+2)}{(x+5)(x+2)} \cdot \frac{3}{(x+5)(x+2)}$

$\frac{x^2+4x+4+3}{(x+5)(x+2)}$

$\frac{x^2+4x+7}{(x+5)(x+2)}$

C