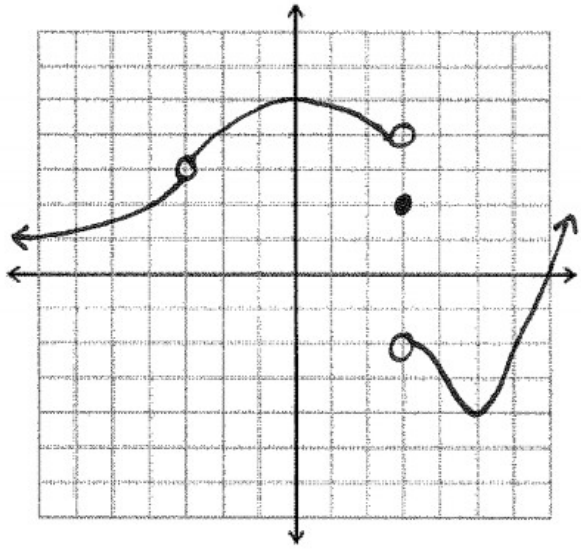
Advanced Math Summer Review
For Students Entering Calculus
Part I: Piecewise Functions

Use the graph to answer each question. Write your answer in the blank.



Use the function f(x), above, to answer questions 1 – 8.

1. Domain (use interval notation): _____

2. The absolute maximum is _____ at x =_____.

3. The absolute minimum is _____ at x =_____.

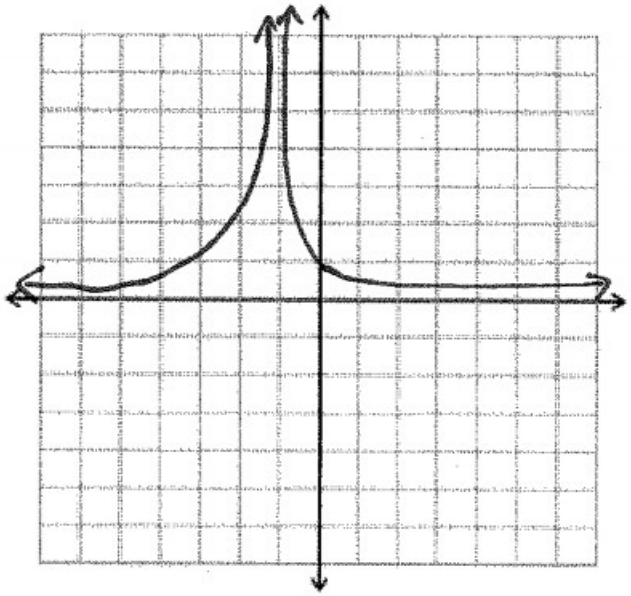
4. f(-3) = _____.

5. f(-2) = _____.

6. f(0) = _____.

7. f(3) = _____.

8. At what value(s) of x is f(x) discontinuous? Classify each discontinuity as removable, jump, or infinite.



Use the function g(x), above, to answer questions 9 - 14. g(x) has a horizontal asymptote at y = 0 and a vertical asymptote at x = -1.

9. Domain: _____

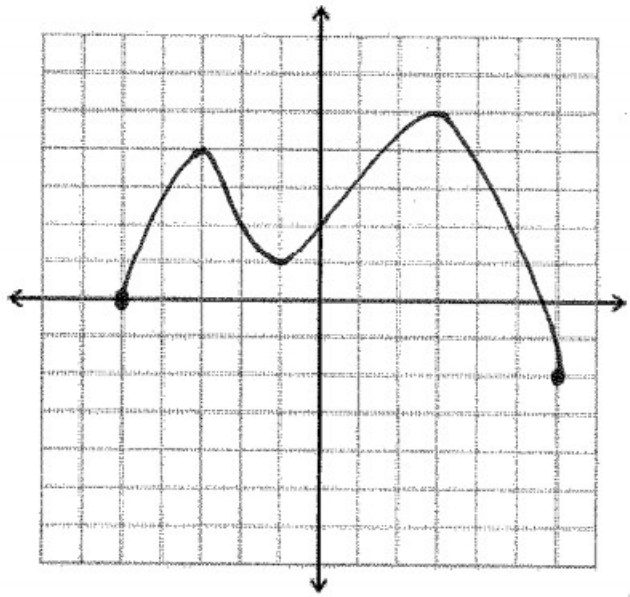
10. Range: _____

11. At what value(s) of x is g(x) discontinuous? Classify each discontinuity as removable, jump, or infinite.

12. x-intercept: _____

13. y-intercept: _____

14. f(-3) = _____



Use the function h(x), above, to answer questions 15 - 20.

15. Domain: _____

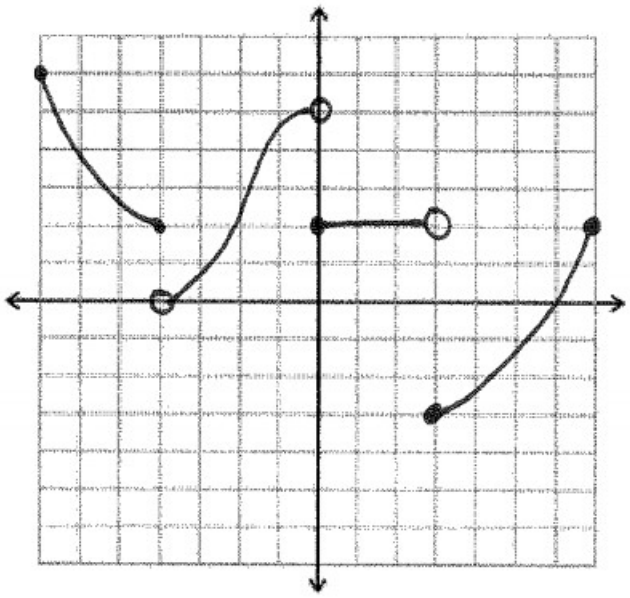
16. Range: _____

17. Find the interval(s) where h(x) is increasing: _____

18. Find the interval(s) where h(x) is decreasing: _____

19. The absolute maximum is _____ at x =_____.

20. The absolute minimum is _____ at x =_____.



Use the function j(x), above, to answer questions 21 - 30.

21. The absolute maximum is _____ at x =_____.

22. The absolute minimum is _____ at x =_____.

23. Find the interval(s) where j(x) is increasing: _____

24. Find the interval(s) where j(x) is decreasing: _____

25. Find the interval(s) where j(x) is constant: _____

26. j(0) = _____

27. j(2) = _____

28. j(3) = _____

29. j(-1) = _____

30. j(-4) = _____

Advanced Math Summer Review
Part II: Trig Values

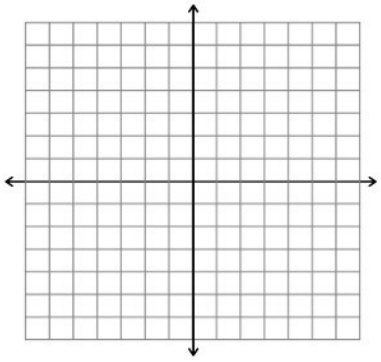
Find the exact value of each trigonometric function. Show all work on loose leaf. Do not use a calculator.

1. $\cot\frac{5\pi}{3}$
2. $\sin\frac{\pi}{3}$
3. $\cos\frac{2\pi}{3}$
4. $\sin\pi$
5. $\tan\frac{2\pi}{3}$
6. $\csc\frac{5\pi}{4}$
7. $\sec\left(-\frac{3\pi}{4}\right)$
8. $\cos\frac{11\pi}{6}$
9. $\sin 4\pi$
10. $\csc\left(-\frac{\pi}{2}\right)$
11. $\tan\left(-\frac{7\pi}{4}\right)$
12. $\sec 0$
13. $\tan\left(-\frac{3\pi}{2}\right)$
14. $\cos\frac{9\pi}{4}$
15. $\sin\frac{7\pi}{6}$
16. $\cos\frac{5\pi}{3}$
17. $\tan\frac{3\pi}{4}$
18. $\sec\frac{2\pi}{3}$
19. $\csc\frac{11\pi}{6}$
20. $\cot\left(-\frac{3\pi}{2}\right)$

Advanced Math Summer Review
Part III: Graphing Functions

Graph each function on the coordinate plane provided. Fill in all required information. You may use your calculator to help you initially, but by the first week of school, you should be able to graph each function without a calculator.

1. $y = x$

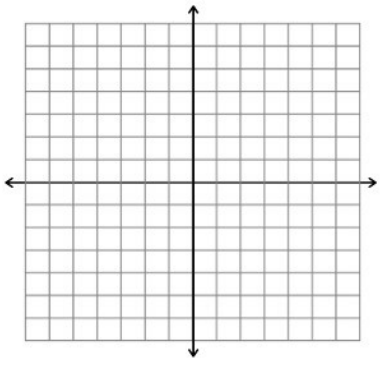


Domain:_____

Range:_____

Slope:_____

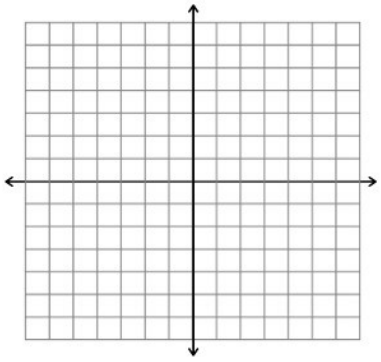
2. $y = x^2$



Domain:_____

Range:_____

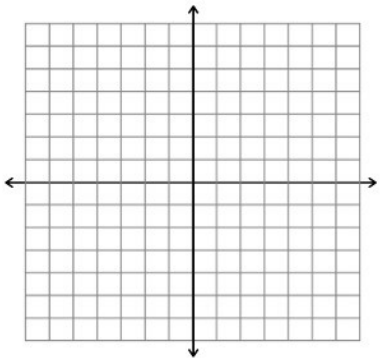
3. $y = x^3$



Domain:_____

Range:_____

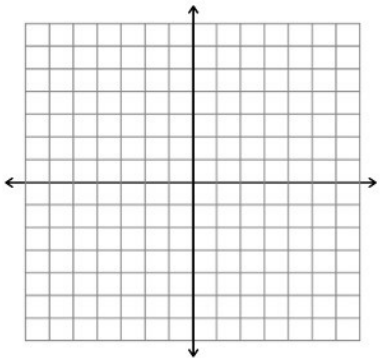
4. $y = \sqrt{x}$



Domain:_____

Range:_____

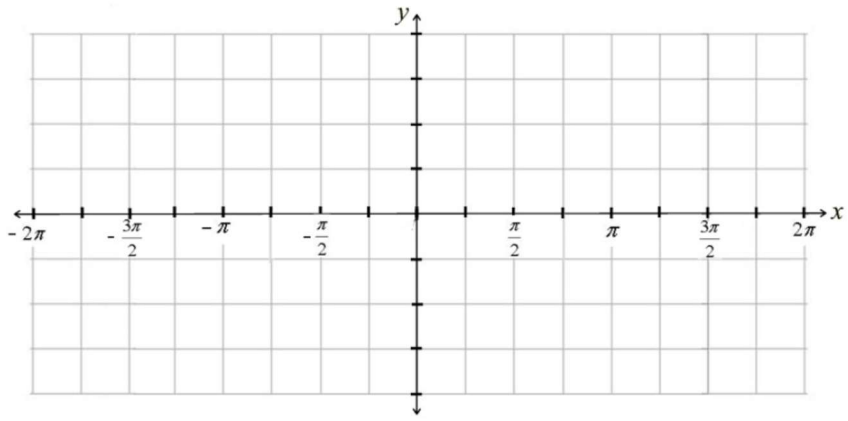
5. $y = \sqrt[3]{x}$



Domain:_____

Range:_____

6. y = sin(x)



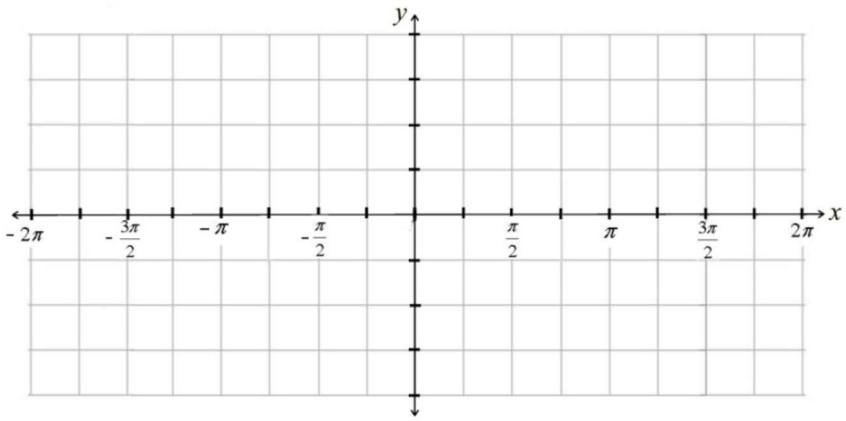
Domain:_____

Range:_____

Amplitude:_____

Period:_____

7. y = cos(x)



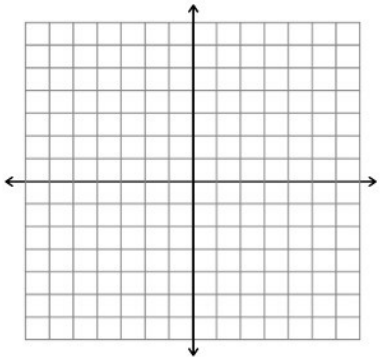
Domain:_____

Range:_____

Amplitude:_____

Period:_____

8. $y = e^x$



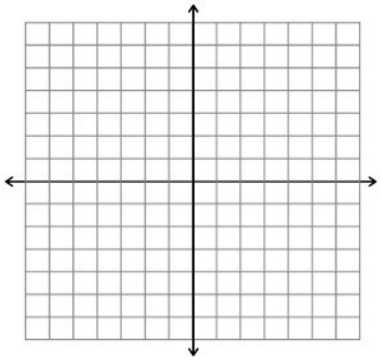
Domain:_____

Range:_____

y-intercept:_____

Asymptote:_____

9. $y = \ln(x)$



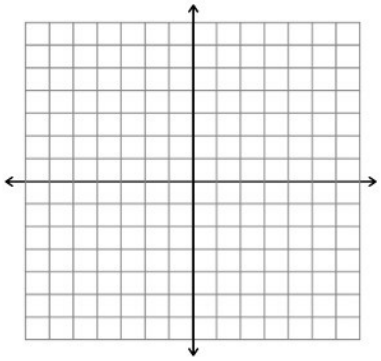
Domain:_____

Range:_____

x-intercept:_____

Asymptote:_____

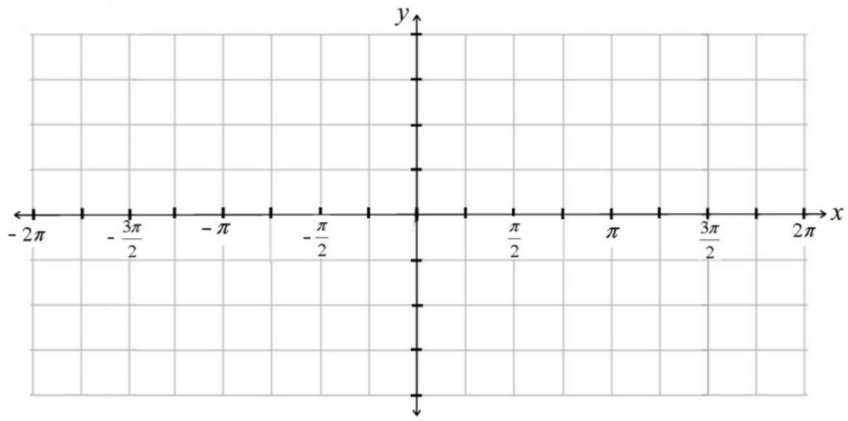
10. $y = |x|$



Domain:_____

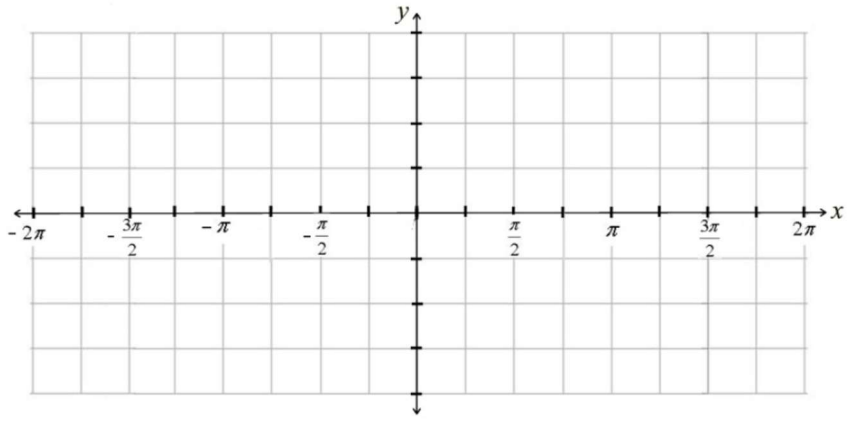
Range:_____

11. y = 3 sin(x) – 1



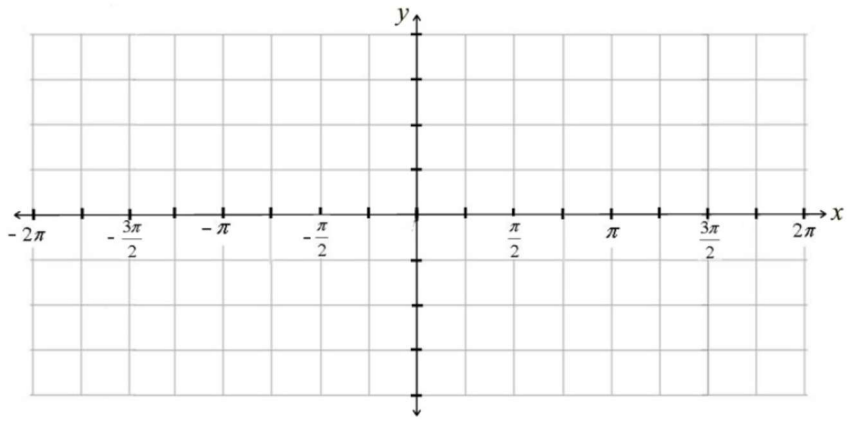
Domain:_____
Range:_____
Amplitude:_____
Period:_____
Vertical Shift:_____
Phase Shift:_____

12. y = sin(4x)



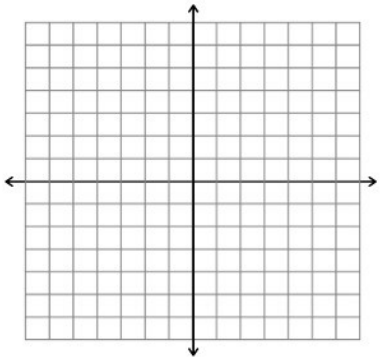
Domain:_____
Range:_____
Amplitude:_____
Period:_____
Vertical Shift:_____
Phase Shift:_____

13. $y = \sin(x + \pi)$



Domain:_____
Range:_____
Amplitude:_____
Period:_____
Vertical Shift:_____
Phase Shift:_____

14. $y = 2^{-x}$



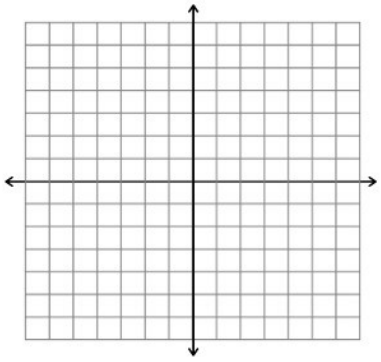
Domain:_____

Range:_____

y-intercept:_____

Asymptote:_____

15. $y = 2^x - 3$



Domain:_____

Range:_____

y-intercept:_____

Asymptote:_____

Advanced Math Summer Review
Part IV: Logarithms

Rewrite each equation on exponential form.

1. $\log_6 36 = 2$

2. $\log_{289} 17 = \frac{1}{2}$

3. $\log_{17} \frac{1}{196} = -2$

4. $\log 1000 = 3$

Rewrite each equation in logarithmic form.

5. $64^{\frac{1}{2}} = 8$

6. $12^2 = 144$

7. $9^{-2} = \frac{1}{81}$

8. $\left(\frac{1}{12}\right)^2 = \frac{1}{144}$

Solve each equation. **Show the work that leads to your answer on loose leaf.** You may use a calculator.

9. $\log 5x = \log(2x + 9)$

10. $\log_2(10 - 4x) = \log_2(10 - 3x)$

11. $2\log_7(-2x) = 0$

12. $-10 + \log_3(n + 3) = -10$

13. $-2\log_5 7x = 2$

14. $-6\log_3(x - 3) = -24$

15. $\log x + \log 8 = 2$

16. $\log_5 x - \log_5 2 = 1$

17. $\log_8 2 + \log_8 4x^2 = 1$

18. $\log_9(x + 6) - \log_9 x = \log_9 2$

19. $4^{2x+3} = 1$

20. $2^{2x+2} = 2^{3x}$

Advanced Math Summer Review
Part V: Factoring

Factor each expression completely. **Show the work that leads to your answer on loose leaf.** Do **NOT** use a calculator.

1. $b^2 + 8b + 7$
2. $m^2 + m - 90$
3. $n^2 - 10n + 9$
4. $m^2 + 2m - 24$
5. $k^2 - 13k + 40$
6. $n^2 - n - 56$
7. $b^2 - 6b + 8$
8. $2n^2 + 6n - 108$
9. $2k^2 + 22k + 60$
10. $p^2 + 11p + 10$
11. $2p^2 + 2p - 4$
12. $x^2 - 15x + 50$
13. $p^2 + 3p - 18$
14. $3p^2 - 2p - 5$
15. $3n^2 - 8n + 4$
16. $2v^2 + 11v + 5$
17. $7a^2 + 53a + 28$
18. $15n^2 - 27n - 6$
19. $4n^2 - 15n - 25$
20. $4n^2 - 17n + 4$
21. $6x^2 + 37x + 6$
22. $6n^2 + 5n - 6$
23. $16n^2 - 9$
24. $16b^2 - 40b + 25$
25. $9x^2 - 1$
26. $n^4 - 100$
27. $k^4 - 36$
28. $98n^2 - 200$
29. $400 - 36v^2$
30. $10n^2 + 100n + 250$

Advanced Math Summer Review Solutions
Part I: Piecewise Functions

1. $(-\infty, -3) \cup (-3, \infty)$
2. The absolute maximum is 5 (y-value) at x = 0.
3. The absolute minimum is -4 at x = -5.
4. Does not exist.
5. 4
6. 5
7. 2
8. x = -3; removable discontinuity and x = 3; jump discontinuity

9. $(-\infty, -1) \cup (-1, \infty)$
10. $(0, \infty)$
11. x = -1; infinite discontinuity
12. none
13. (0, 1)
14. 1

15. [-5, 6]
16. [-2, 5]
17. [-5, -3] U [-1, 3]
18. [-3, -1] U [3, 6]
19. The absolute maximum is 5 at x = 3.
20. The absolute minimum is -2 at x = 6.

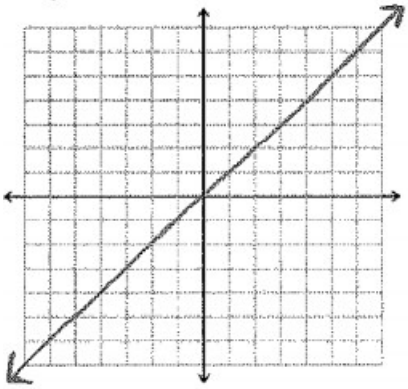
21. The absolute maximum is 6 at x = -7.
22. The absolute minimum is -3 at x = 3.
23. (4, 0) U [3, 7]
24. [-7, -4]
25. [0, 3)
26. 2
27. 2
28. -3
29. 4.5
30. 2

Advanced Math Summer Review Solutions
Part II: Trig Values

1. $\frac{-\sqrt{3}}{3}$
2. $\frac{\sqrt{3}}{2}$
3. -1/2
4. 0
5. $-\sqrt{3}$
6. $-\sqrt{2}$
7. $-\sqrt{2}$
8. $\frac{\sqrt{3}}{2}$
9. 0
10. -1
11. 1
12. 1
13. undefined
14. $\frac{\sqrt{2}}{2}$
15. -1/2
16. 1/2
17. -1
18. -2
19. -2
20. 0

Advanced Math Summer Review Solutions
Part III: Graphing Functions

1. $y = x$

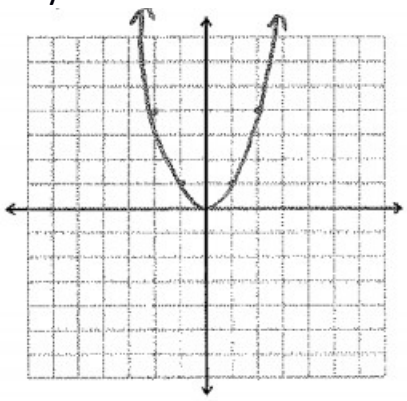


Domain: $(-\infty, \infty)$

Range: $(-\infty, \infty)$

Slope: 1

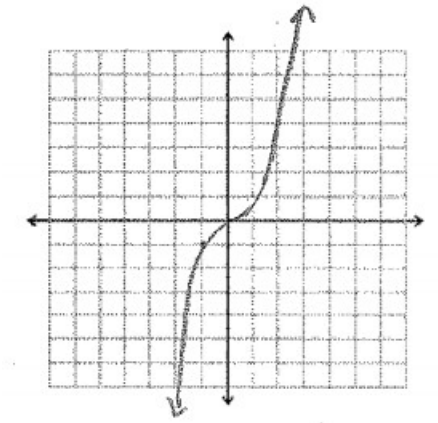
2. $y = x^2$



Domain: $(-\infty, \infty)$

Range: $[0, -\infty)$

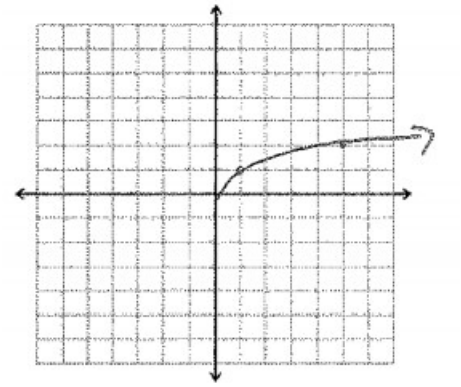
3. $y = x^3$



Domain:(-∞, ∞)

Range:(-∞, ∞)

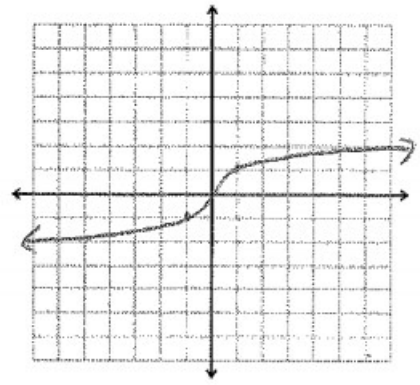
4. $y = \sqrt{x}$



Domain:[0, ∞)

Range: [0, ∞)

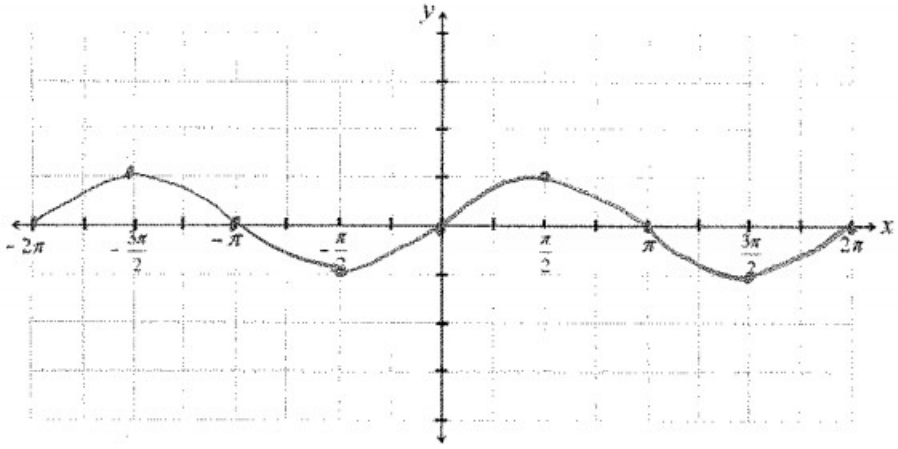
5. $y = \sqrt[3]{x}$



Domain: (-∞, ∞)

Range: (-∞, ∞)

6. y = sin(x)



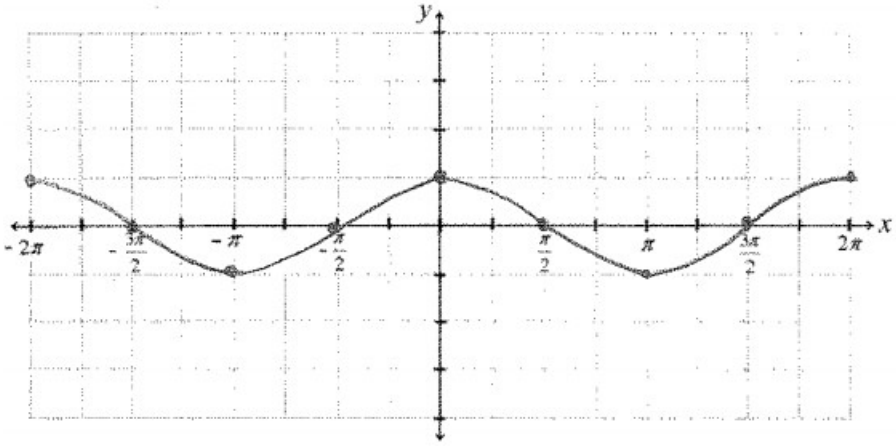
Domain: (-∞, ∞)

Range: [-1, 1]

Amplitude: 1

Period: 2π

7. y = cos(x)



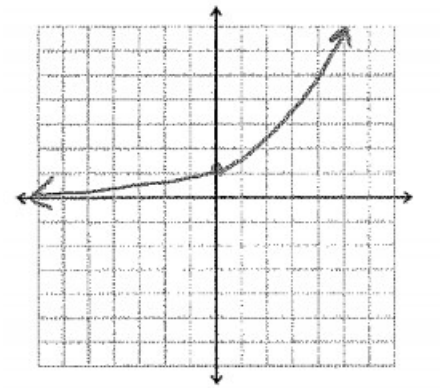
Domain: (-∞, ∞)

Range:[-1, 1]

Amplitude: 1

Period: 2π

8. $y = e^x$



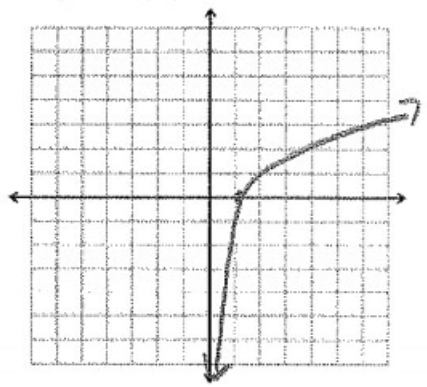
Domain: (-∞, ∞)

Range: (0, ∞)

y-intercept: (0, 1)

Asymptote: y = 0 (x-axis)

9. $y = \ln(x)$



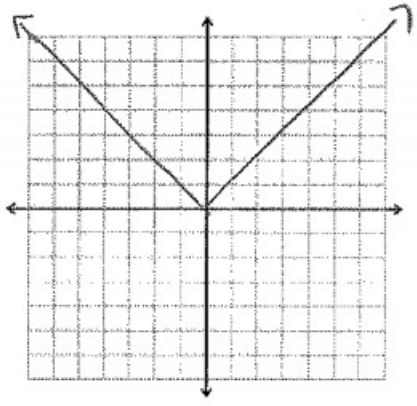
Domain: $(0, \infty)$

Range: $(-\infty, \infty)$

x-intercept: $(1, 0)$

Asymptote: $x = 0$ (y-axis)

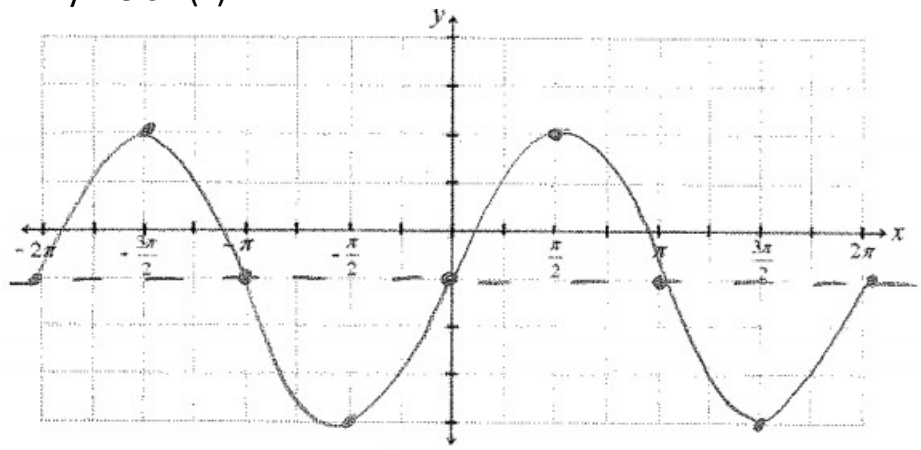
10. $y = |x|$



Domain: $(-\infty, \infty)$

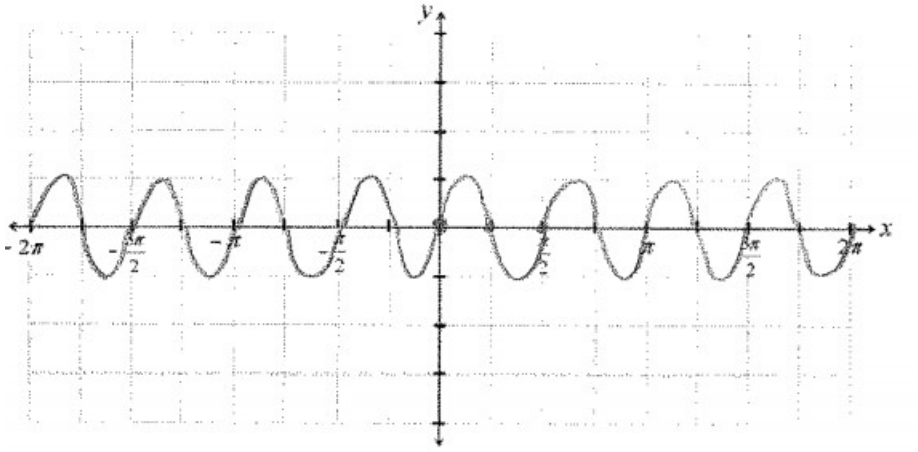
Range: $(-\infty, \infty)$

11. $y = 3 \sin(x) - 1$



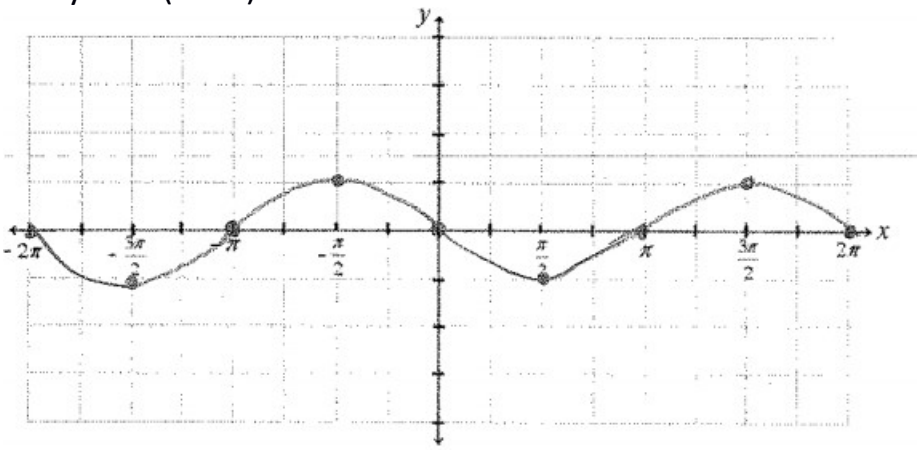
Domain: $(-\infty, \infty)$
Range: $[-4, 2]$
Amplitude: 3
Period: 2π
Vertical Shift: 1 down
Phase Shift: none

12. $y = \sin(4x)$



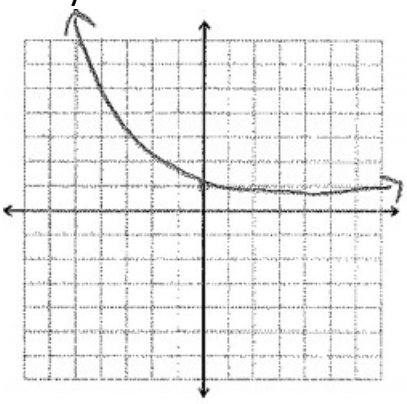
Domain: $(-\infty, \infty)$
Range: $[-1, 1]$
Amplitude: 1
Period: $\pi/2$
Vertical Shift: none
Phase Shift: none

13. $y = \sin(x + \pi)$



Domain: $(-\infty, \infty)$
Range: $[-1, 1]$
Amplitude: 1
Period: 2π
Vertical Shift: none
Phase Shift: π left

14. $y = 2^{-x}$



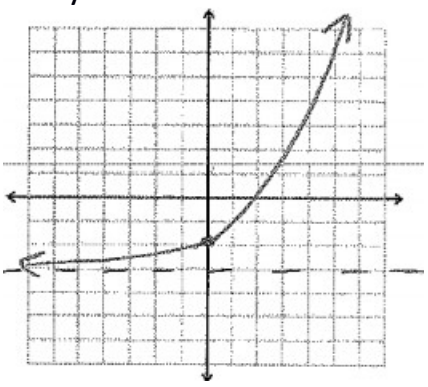
Domain: $(-\infty, \infty)$

Range: $(0, \infty)$

y-intercept: (0, 1)

Asymptote: y = 0 (x-axis)

15. $y = 2^x - 3$



Domain: $(-\infty, \infty)$

Range: $(-3, \infty)$

y-intercept: $(0, -2)$

Asymptote: $y = -3$

Advanced Math Summer Review Solutions
Part IV: Logarithms

1. $6^2 = 36$

2. $289^{\frac{1}{2}} = 17$

3. $17^{-2} = \frac{1}{196}$

4. $10^3 = 1000$

5. $\log_{64} 8 = \frac{1}{2}$

6. $\log_{12} 144 = 2$

7. $\log_9 \frac{1}{81} = -2$

8. $\log_{\frac{1}{12}} \frac{1}{144} = 2$

9. $\log 5x = \log(2x+9)$

$5x = 2x + 9$
$-2x \quad -2x$
$\frac{3x}{3} = \frac{9}{3}$
$x = 3$

10. x = 0

11. x = -1/2

12. $-10 + \log_3(n+3) = -10$

$+10 \quad +10$
$\log_3(n+3) = 0$
$3^0 = n + 3$
$1 = n + 3$
$-2 = n$

13. x = 1/35

14. x = 84

15. $\log x + \log 8 = 2$

$\log_{10} 8x = 2$

$10^2 = 8x$

$\frac{100}{8} = \frac{8x}{8}$

$\frac{25}{2} = x$

16. x = 10

17. x = ±1

18. x = 6

19. $4^{2x+3} = 1$

$\log_4(1) = 2x + 3$

$-3 \qquad -3$

$\frac{\log_4(1) - 3}{2} = \frac{2x}{2}$

$\frac{\log_4(1) - 3}{2} = x$

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

20. x = 2

Advanced Math Summer Review Solutions
Part V: Factoring

1. $(b + 7)(b + 1)$

2. $(m – 9)(m + 10)$

3. $(n – 1)(n – 9)$

4. $(m + 6)(m – 4)$

5. $(k – 5)(k – 8)$

6. $(n + 7)(n – 8)$

7. $(b – 4)(b – 2)$

8. $2(n + 9)(n – 6)$

9. $2(k + 5)(k + 6)$

10. $(p + 10)(p + 1)$

11. $2(p – 1)(p + 2)$

12. $(x – 10)(x – 5)$

13. $(p – 3)(p + 6)$

14. $(3p – 5)(p + 1)$

15. $(3n – 2)(n – 2)$

16. $(2v + 1)(v + 5)$

17. $(7a + 4)(a + 7)$

18. $3(5n + 1)(n – 2)$

19. $(n – 5)(4n + 5)$

20. $(n – 4)(4n – 1)$

21. $(x + 6)(6x + 1)$

22. $(2n + 3)(3n – 2)$

23. $(4n + 3)(4n – 3)$

24. $(4b – 5)^2$

25. $(3x + 1)(3x – 1)$

26. $(n^2 + 10)(n^2 – 10)$

27. $(k^2 + 6)(k^2 – 6)$

28. $2(7n + 10)(7n – 10)$

29. $4(10 + 3v)(10- 3v)$

30. $10(n + 5)^2$