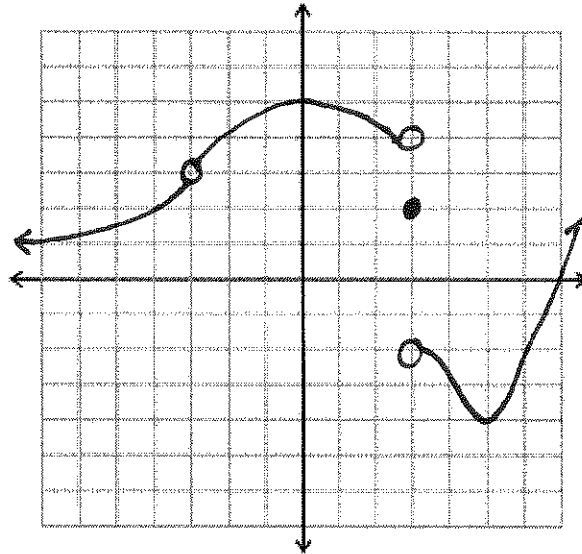
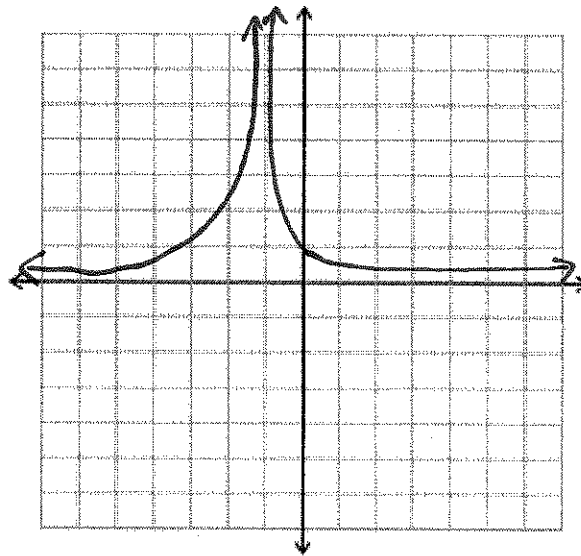


## Advanced Math Summer Review Piecewise Functions



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

1. Domain (use interval notation): \_\_\_\_\_
2. The absolute maximum is \_\_\_\_\_ at \_\_\_\_\_.
3. The absolute minimum is \_\_\_\_\_ at \_\_\_\_\_.
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: \_\_\_\_\_

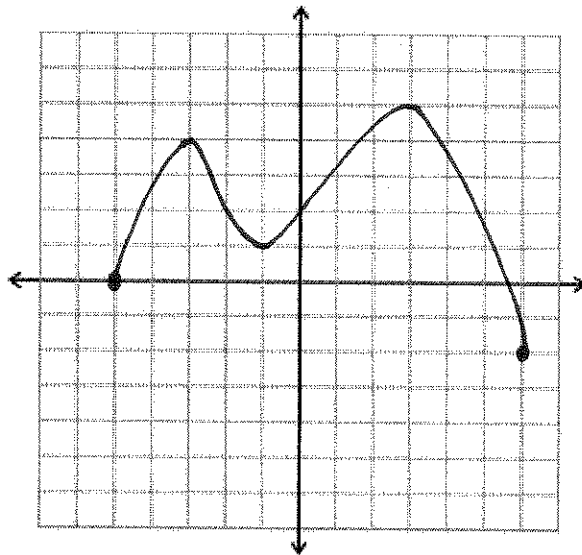
10. Range: \_\_\_\_\_

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: \_\_\_\_\_

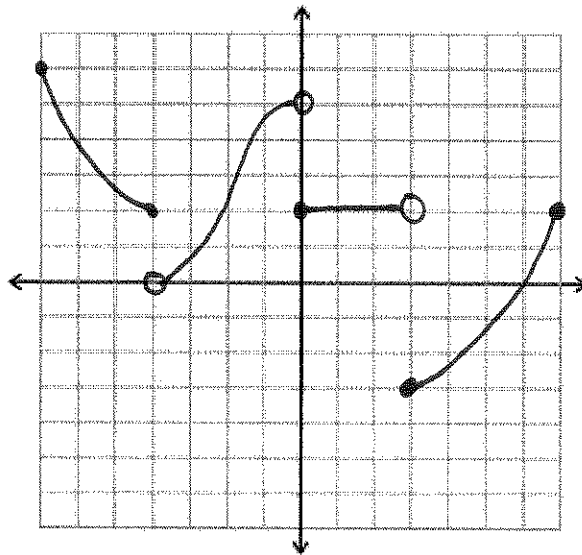
16. Range: \_\_\_\_\_

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 \_\_\_\_\_.

20. The absolute minimum is \_\_\_\_\_ at \_\_\_\_\_.



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

21. The absolute maximum is \_\_\_\_\_ at \_\_\_\_\_.

22. The absolute minimum is \_\_\_\_\_ at \_\_\_\_\_.

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.  $\cot \frac{5\pi}{3}$

11.  $\tan\left(-\frac{7\pi}{4}\right)$

2.  $\sin \frac{\pi}{3}$

12.  $\sec 0$

3.  $\cos \frac{2\pi}{3}$

13.  $\tan\left(-\frac{3\pi}{2}\right)$

4.  $\sin \pi$

14.  $\cos \frac{9\pi}{4}$

5.  $\tan \frac{2\pi}{3}$

15.  $\sin \frac{7\pi}{6}$

6.  $\csc \frac{5\pi}{4}$

16.  $\cos \frac{5\pi}{3}$

7.  $\sec\left(-\frac{3\pi}{4}\right)$

17.  $\tan \frac{3\pi}{4}$

8.  $\cos \frac{11\pi}{6}$

18.  $\sec \frac{2\pi}{3}$

9.  $\sin 4\pi$

19.  $\csc \frac{11\pi}{6}$

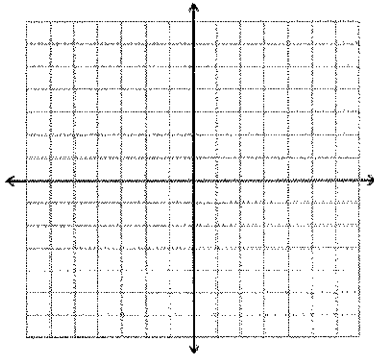
10.  $\csc\left(-\frac{\pi}{2}\right)$

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. By the first week of school in August, you should be able to graph each function without a calculator.

1.  $y = x$

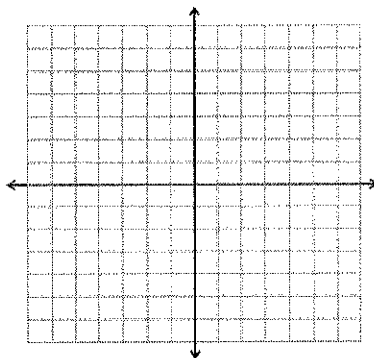


Domain: \_\_\_\_\_

Range: \_\_\_\_\_

Slope: \_\_\_\_\_

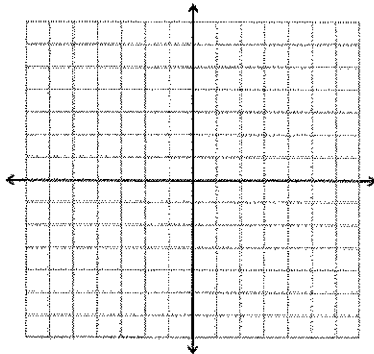
2.  $y = x^2$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

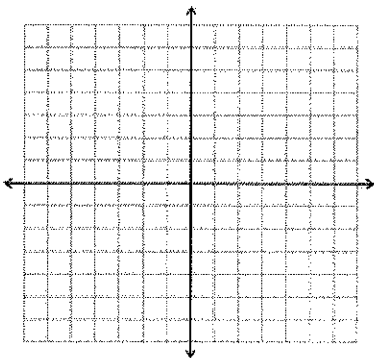
3.  $y = x^3$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

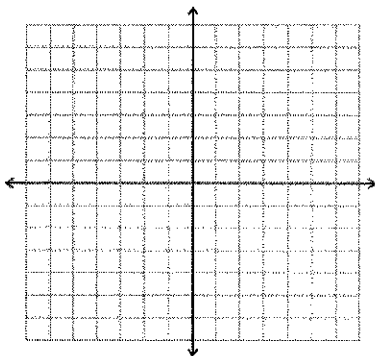
4.  $y = \sqrt{x}$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

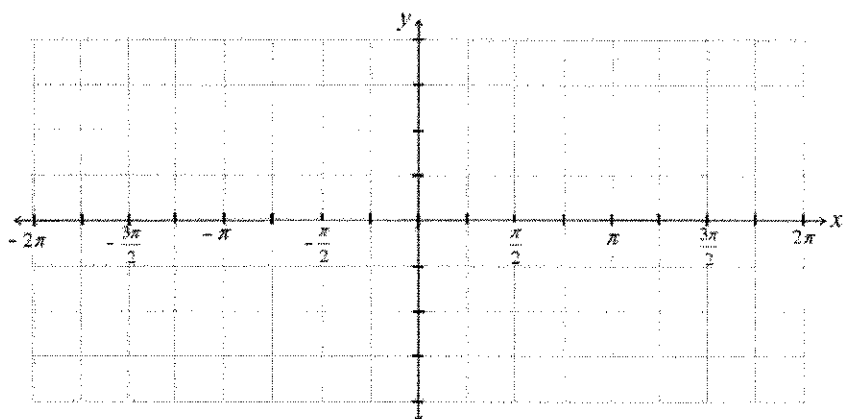
5.  $y = \sqrt[3]{x}$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

6.  $y = \sin(x)$



Domain: \_\_\_\_\_

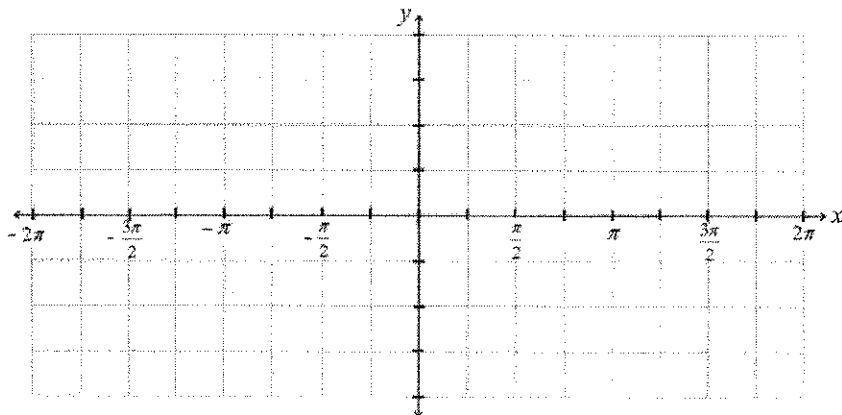
Range: \_\_\_\_\_

Amplitude: \_\_\_\_\_

Period: \_\_\_\_\_



7.  $y = \cos(x)$



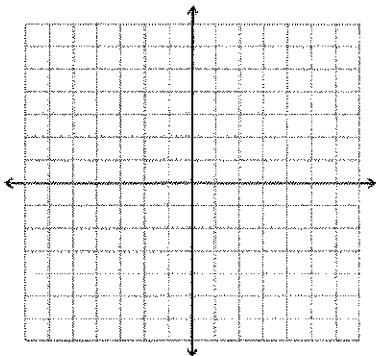
Domain: \_\_\_\_\_

Range: \_\_\_\_\_

Amplitude: \_\_\_\_\_

Period: \_\_\_\_\_

8.  $y = e^x$



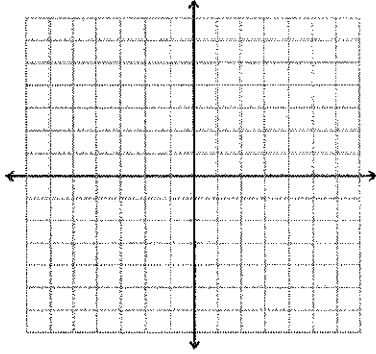
Domain: \_\_\_\_\_

Range: \_\_\_\_\_

y-intercept: \_\_\_\_\_

Asymptote: \_\_\_\_\_

9.  $y = \ln(x)$



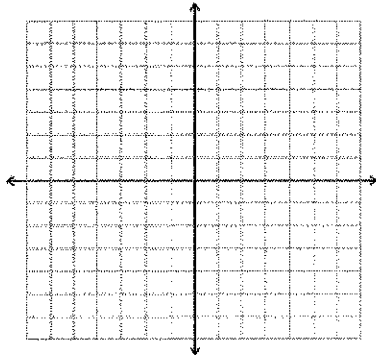
Domain: \_\_\_\_\_

Range: \_\_\_\_\_

x-intercept: \_\_\_\_\_

Asymptote: \_\_\_\_\_

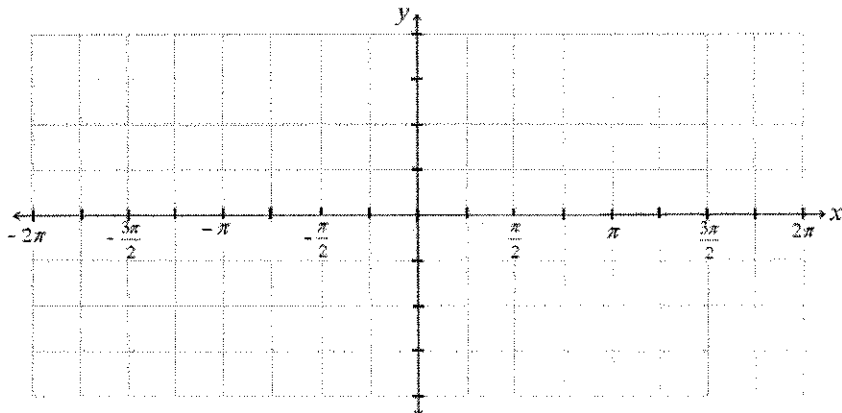
10.  $y = |x|$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

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



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

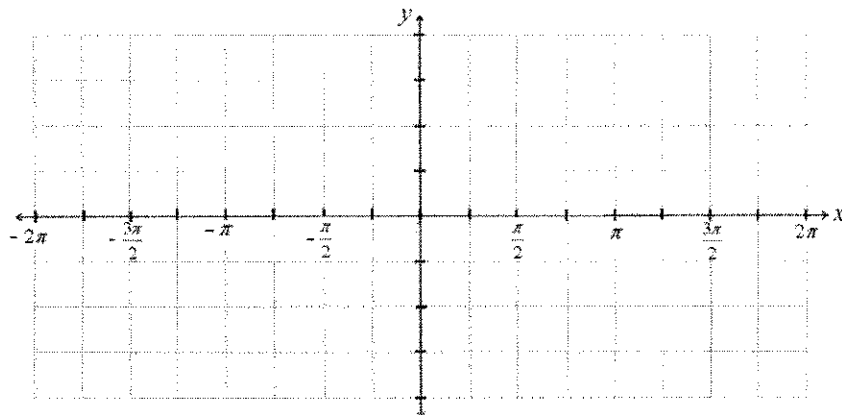
Amplitude: \_\_\_\_\_

Period: \_\_\_\_\_

Vertical Shift: \_\_\_\_\_

Phase Shift: \_\_\_\_\_

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



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

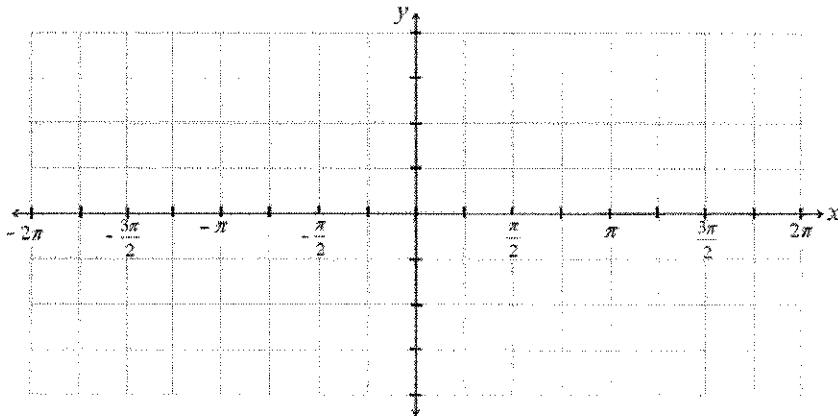
Amplitude: \_\_\_\_\_

Period: \_\_\_\_\_

Vertical Shift: \_\_\_\_\_

Phase Shift: \_\_\_\_\_

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



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

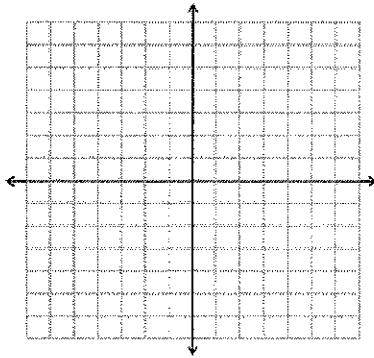
Amplitude: \_\_\_\_\_

Period: \_\_\_\_\_

Vertical Shift: \_\_\_\_\_

Phase Shift: \_\_\_\_\_

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



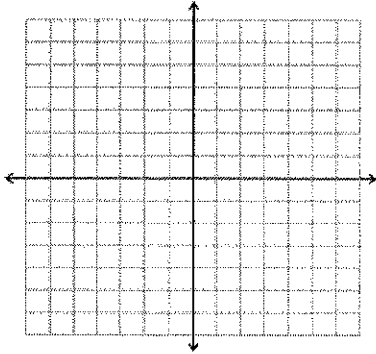
Domain: \_\_\_\_\_

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

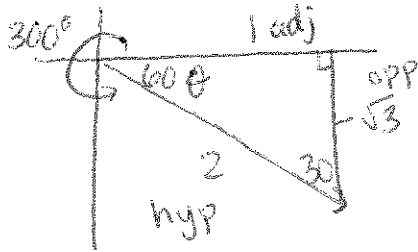
1.  $(-\infty, -3) \cup (-3, \infty)$
2. The absolute maximum is 5 (y-value) at  $x = 0$ .
3. The absolute minimum is -4 at  $x = -5$ .
4. Does not exist.
5. 4
6. 5
7. 2
8.  $x = -3$ ; removable discontinuity      and       $x = 3$ ; jump discontinuity
  
9.  $(-\infty, -1) \cup (-1, \infty)$
10.  $(0, \infty)$
11.  $x = -1$ ; infinite discontinuity
12. none
13.  $(0, 1)$
14. 1
  
15.  $[-5, 6]$
16.  $[-2, 5]$
17.  $[-5, -3] \cup [-1, 3]$
18.  $[-3, -1] \cup [3, 6]$
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.  $(4, 0) \cup [3, 7]$
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.  $\frac{-\sqrt{3}}{3}$       $\cot \theta = \frac{1}{\tan \theta} = \frac{\text{Adj}}{\text{Opp}}$      11. 1

$\frac{5\pi}{3} \cdot \frac{180}{\pi} = 300^\circ$



$\cot \frac{5\pi}{3} = \frac{1}{-\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \boxed{\frac{-\sqrt{3}}{3}}$

2.  $\frac{\sqrt{3}}{2}$      12. 1

3.  $-1/2$      13. undefined

4. 0     14.  $\frac{\sqrt{2}}{2}$

5.  $-\sqrt{3}$      15.  $-1/2$

6.  $-\sqrt{2}$      16.  $1/2$

7.  $-\sqrt{2}$      17.  $-1$

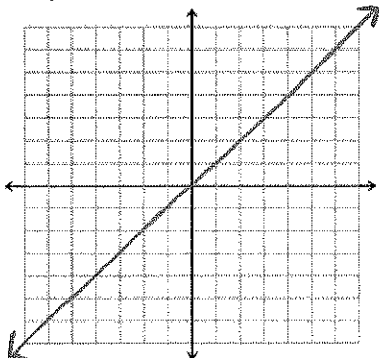
8.  $\frac{\sqrt{3}}{2}$      18.  $-2$

9. 0     19.  $-2$

10.  $-1$      20. 0

Advanced Math Summer Review Solutions  
Part III: Graphing Functions

1.  $y = x$

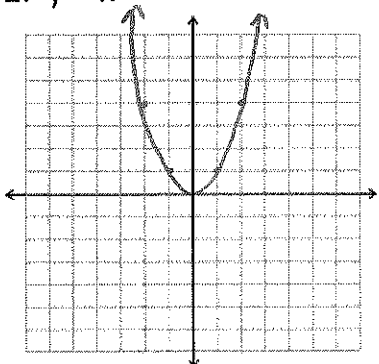


Domain:  $(-\infty, \infty)$

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

Slope: 1

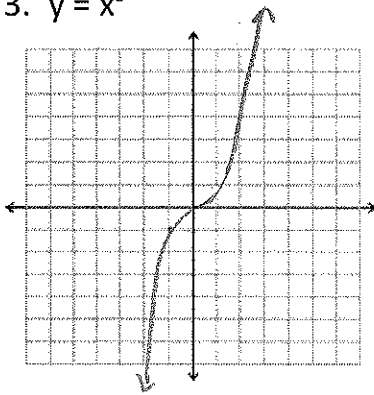
2.  $y = x^2$



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

Range:  $[0, \infty)$

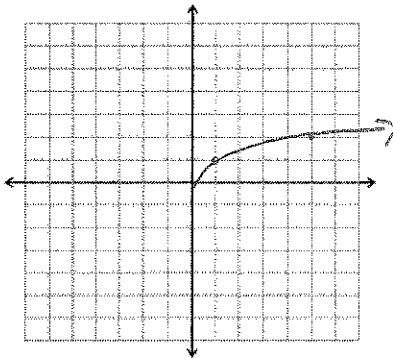
3.  $y = x^3$



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

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

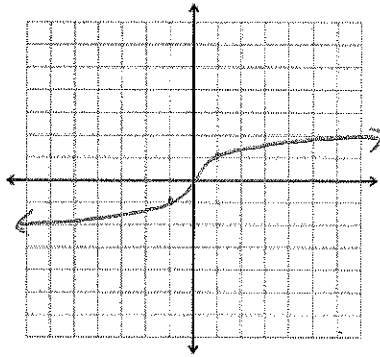
4.  $y = \sqrt{x}$



Domain:  $[0, \infty)$

Range:  $[0, \infty)$

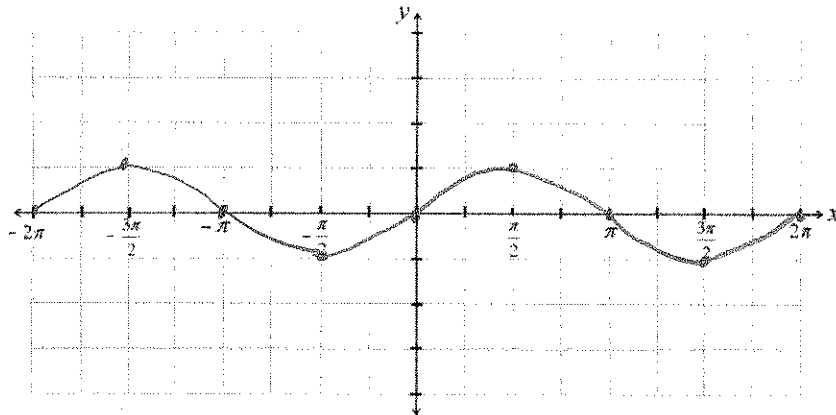
5.  $y = \sqrt[3]{x}$



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

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

6.  $y = \sin(x)$



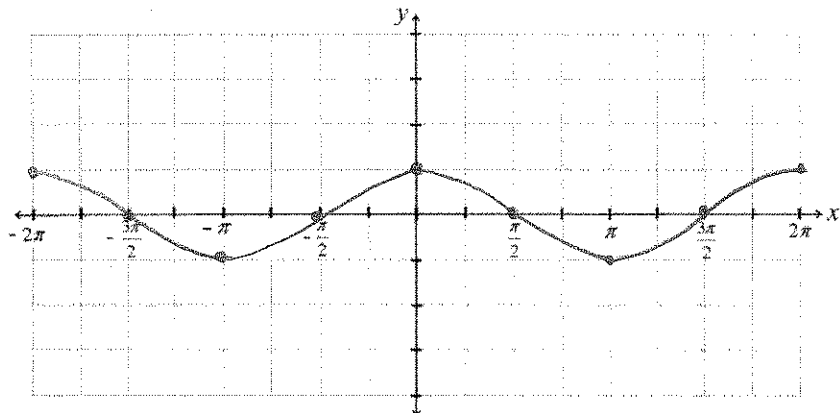
Domain:  $(-\infty, \infty)$

Range:  $[-1, 1]$

Amplitude: 1

Period:  $2\pi$

7.  $y = \cos(x)$



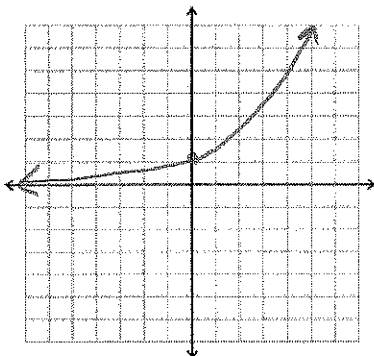
Domain:  $(-\infty, \infty)$

Range:  $[-1, 1]$

Amplitude: 1

Period:  $2\pi$

8.  $y = e^x$



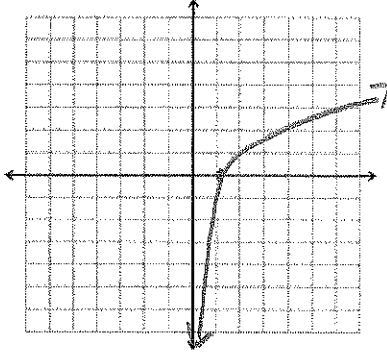
Domain:  $(-\infty, \infty)$

Range:  $(0, \infty)$

y-intercept:  $(0, 1)$

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

9.  $y = \ln(x)$



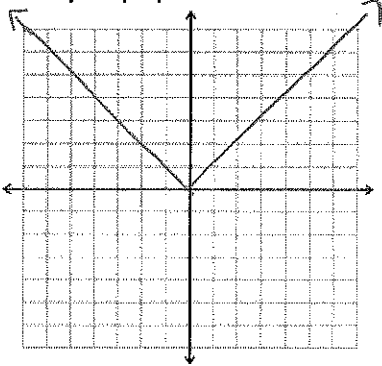
Domain:  $(0, \infty)$

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

x-intercept:  $(1, 0)$

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

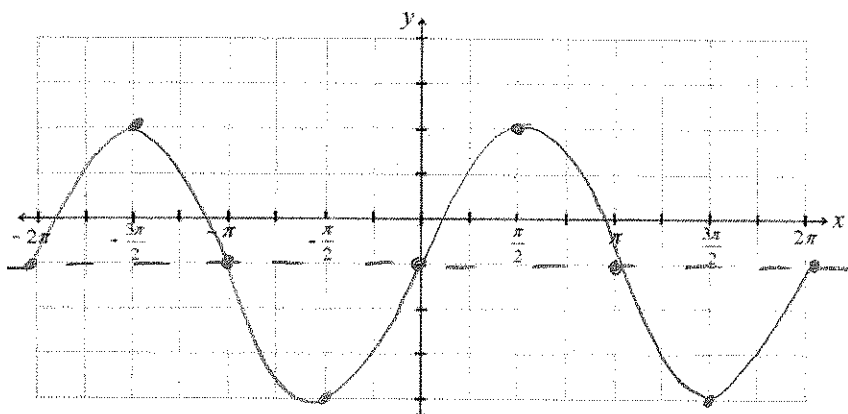
10.  $y = |x|$



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

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

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



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

Range:  $[-4, 2]$

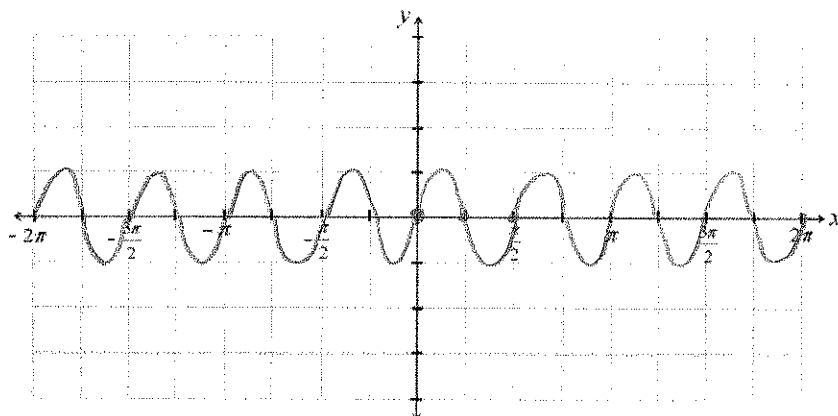
Amplitude: 3

Period:  $2\pi$

Vertical Shift: 1 down

Phase Shift: none

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



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

Range:  $[-1, 1]$

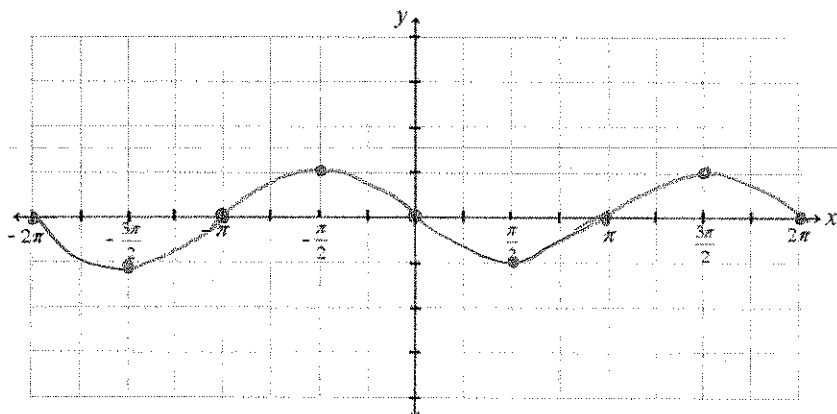
Amplitude: 1

Period:  $\pi/2$

Vertical Shift: none

Phase Shift: none

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



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

Range:  $[-1, 1]$

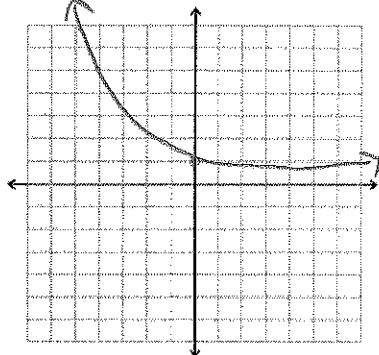
Amplitude: 1

Period:  $2\pi$

Vertical Shift: none

Phase Shift:  $\pi$  left

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



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

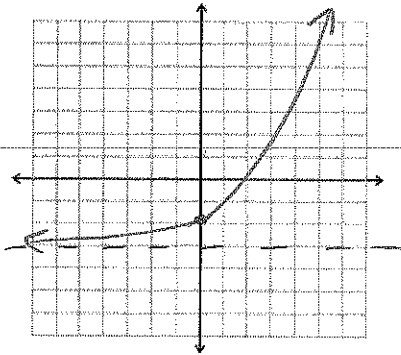
Range:  $(0, \infty)$

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

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

10.  $x = 0$

$$\begin{array}{r} 5x = 2x + 9 \\ -2x \quad -2x \\ \hline 3x = 9 \\ \frac{3x}{3} = \frac{9}{3} \\ \boxed{x = 3} \end{array}$$

11.  $x = -1/2$

$$\begin{array}{r} -10 + \log_3(n+3) = -10 \\ +10 \qquad \qquad +10 \\ \hline \log_3(n+3) = 0 \\ 3^0 = n+3 \\ 1 = n+3 \\ \boxed{-2 = n} \end{array}$$

13.  $x = 1/35$

14.  $x = 84$

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

16.  $x = 10$

$$\begin{array}{r} \log_{10} 8x = 2 \\ 10^2 = 8x \\ \frac{100}{8} = \frac{8x}{8} \\ \boxed{\frac{25}{2} = x} \end{array}$$

17.  $x = \pm 1$

18.  $x = 6$

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

20.  $x = 2$

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

---

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

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

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

Advanced Math Summer Review Solutions  
Part V: Factoring

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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.  $10(n + 5)^2$