Summer Review For Prospective Calculus Students

The following problems represent a set of "prerequisite skills" for Calculus students. While they are not comprehensive, they provide guidance about what one needs to know. Additional important skills to bring to the course include the ability to read a text, the ability to ask questions and pose conjectures, and the desire to work hard. Calculus students will need to use graphing calculators in an efficient and appropriate manner as well.

Over the summer we encourage you to do the problems as a way to stay in touch with math. We also encourage you to experiment a bit with your graphing calculators. Make sure that you know how to graph, find roots, intersection points, and maximum and minimum points. You may want to preview some of the calculus features of the machines as well.

Enjoy your summer! We look forward to seeing your smiling (and prepared!) faces in the fall.

[SEE ANSWERS AT END OF PACKET.]

ALGEBRA SKILLS

1. Number-line relationships. True or false: $-2 < -5/2$.
2. Number-line graphing. Graph the following on a number line: (a) $x \leq 7$; (b) $-2 \leq x < 4$.
3. Properties of the absolute-value function. True or false: (a) $|ab| = |a|\,|b|$; (b) $|a/b| = |a| / |b|$; (c) $|b-a| = |a-b|$; (d) $|a+b| \leq |a| + |b|$
4. Division by zero. $8/0 = ?$
5. Division of zero by another finite number. $0/-11 = ?$
6. Solving inequalities. Solve: (a) $2x+7 \geq 4x-8$; (b) $-3x \leq 17$.
7. Distance, slope and midpoint formulas on the Cartesian plane. For A(1,-2) and B(-2,-4), find: (a) the distance between A and B; (b) the slope of $\overline{AB}$; (c) the midpoint of $\overline{AB}$.

Finding equations of straight lines.

8. For A and B in the last problem, find the equation of $\overleftrightarrow{AB}$ in: (a) slope-intercept form; (b) point-slope form.
9. Finding equations of parallel lines. Find the equation of the line containing (2,5) that is parallel to $\overleftrightarrow{AB}$ in problem 7.
10. Finding equations of perpendicular lines. Find the equation of the line containing (-2,3) that is perpendicular to $\overleftrightarrow{AB}$ in problem 7.
11. Factoring polynomials. Factor the following: (a) $4x^3-6x^2-8x$; (b) $9x^2-16$; (c) $3x^3-9x^2-30x$; (d) $6x^2+x-35$. (Factor over integers.)
12. Completing the square of a quadratic polynomial. Complete the square of $x^2-8x+12$.
13. Solving quadratic equations (by factoring and quadratic formula). Solve the following: (a) $x^2-15x+54 = 0$; (b) $2x^2-6x-7 = 0$.
14. Solving higher-order equations. Solve the following: $6x^4-23x^3+9x^2+18x = 0$.
15. Solving radical equations. Solve the following: (a) $\sqrt{x+3} = x+1$; (b) $\sqrt[3]{x} = x$.
16. Solving systems of equations algebraically (using linear, quadratic, and higher-order functions). Solve the following: (a) $\begin{cases} 3x-4y = 15 \\ 2x+5y = -13; \end{cases}$

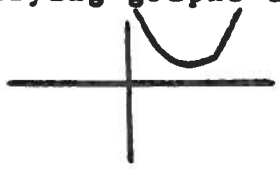
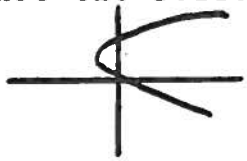
    (b) $\begin{cases} x^2+4y^2 = 36 \\ x^2 = -y+3. \end{cases}$
17. Proper use of function notation. If $f(x) = 2x^2-3x+7$, find: (a) $f(2)$; (b) $f(3x)$.
18. Formation of composite functions. If $f(x) = \sqrt{x}$ and $g(x) = x+4$, find: (a) $f(g(x))$; (b) $g(f(x))$.

ALGEBRA SKILLS (continued)

19. Identifying equations as functions. True or false: (a) If $y = 2x^2$, then y is a function of x; (b) If $x = |y|$, then y is a function of x.
20. Simplifying rational expressions. $(x^2+8x+12)/(x^3-4x) = ?$
21. Rationalizing the numerator or denominator of a rational expression. Rationalize the numerator of $(x+\sqrt{x})/(x-1)$.
22. Multiplying radical expressions. Multiply $(\sqrt{x+3}+\sqrt{x})(\sqrt{x+3}-\sqrt{x})$.
23. Multiplying the numerator and denominator of a rational expression by the same term. Multiply $\dfrac{3x^2-6x+7}{4x^2+x-6} \cdot \dfrac{(1/x^2)}{(1/x^2)}$.
24. $(a+b)/c = (a/c) + (b/c)$. True or false: (a) $(x^2+x+1)/(x^2+1)$ $= 1 + x/(x^2+1)$
(b) $1/(x+1) = (1/x)+1$.
25. Simplifying complex rational expressions. Simplify: $\dfrac{1+1/x}{1-1/x}$.
26. Rules for multiplying, dividing, and taking powers of exponential expressions. Simplify: (a) $x^6 \cdot x^5$; (b) x^{11}/x^4 ; (c) $(x^2y^3)^2 \cdot (xy^4)^3$.
27. Negative exponents. True or false: (a) $1/(x-3)^2 = (x-3)^{-2}$; (b) $1/(3x^3) = 3x^{-3}$.
28. Conversion from radical expression to exponential form. True or false: (a) $\sqrt{x+4} = (x+4)^{1/2}$; (b) $\sqrt[3]{x} = x^{-3}$.
29. Division with improper rational functions. Use long division to find the quotient and remainder of: $x^3/(x^2+1)$.
30. Multiplying polynomials. Multiply: (a) $(x+3)(x^2+6x+3)$; (b) $(x-5)^2$.
31. Addition and subtraction of rational expressions with different denominators. (a) $1/(x+3) + 1/(x-3) = ?$ (b) $1/(x^2-4) - 1/(x+2) = ?$
32. $\log_b 1$ and $\log_b b$. (a) $\log_{44} 1 = ?$ (b) $\log_{27} 27 = ?$
33. Conversion from logarithmic to exponential form, and vice versa. (a) Change to exponential form: $\log_3 81 = 4$; (b) Change to logarithmic form: $5^2 = 25$.
34. Rules for the logarithm of products, quotients, and exponential expressions. Solve the following: (a) $\log_4(x-3)+\log_4(x+3) = 2$; (b) $\log_2(4x+10)-\log_2(x+1) = 3$; (c) $\log_7 7^x = 14.5$.
35. Natural logs and the approximate value of e. Evaluate: (a) e (3 decimal places); (b) $\ln e$; (c) $\ln e^2$.
36. Sigma notation. Evaluate: (a) $\sum_{i=1}^{5}(i^2+1)$; (b) $\sum_{i=1}^{3} 4$.
37. Formula d=rt. If the distance traveled is 150 miles in 5 hours, what is the average velocity?
38. Operations with complex numbers. Put each of the following in standard form: (a) $(3+4i)+(2-3i)$; (b) $(13-6i)-(2-4i)$; (c) $(2-5i)(6+i)$; (d) $(5+2i)/(3-i)$.
39. Solving quadratic equations with imaginary solutions. Solve: $2x^2-3x+5$

ANALYTIC GEOMETRY SKILLS

1. Ordered-pair graphing. Graph: (a) (6,0); (b) (-1,2); (c) (0,-3); (d) (4,-2).
2. Graphing straight lines (with table of values). Use a table of values to graph $2x+3y = 6$.
3. Graphing straight lines (using slope and y-intercept). Use slope and y-intercept to graph $4x-2y = 8$.
4. Graphing vertical and horizontal lines by looking at the equations. Graph: (a) $x = 4$; (b) $y = -3$.
5. Graph of absolute-value function. Graph $y = |x|$.
6. Graphing of quadratic functions (with table of values). Use a table of values to graph: $y = x^2-2x+3$.
7. Graphing of higher-order functions (with table of values). Use a table of values to graph: $y = x^3-2x^2-x+2$.
8. x- and y-intercepts. Find the x- and y-intercepts of $y = x^2+x-6$.
9. Slope of parallel lines. State the slope of a line parallel to $3x+5y = 7$.
10. Slope of perpendicular lines. State the slope of a line perpendicular to $3x+5y = 7$.
11. Graphs of lines with different slopes. Sketch a line whose slope is: (a) positive; (b) negative; (c) zero; (d) undefined (infinite).
12. Recognizing type of 1st or 2nd degree graph by looking at the equation. Identify the type of graph without actually graphing: (a) $2x+3y = 5$; (b) $y = x^2-2x+6$; (c) $x^2+y^2 = 16$; (d) $(x-2)^2/4 + (y+1)^2/9 = 1$; (e) $x^2/6 - y^2/6 = 1$.
13. Identifying graphs as functions. Are the following functions:

(a)  (b) 

14. Identifying domain and range of functions from equations. Find the domain and range of $y = \sqrt{x^2-9}$.
15. Graphing functions that approach vertical and horizontal asymptotes. Graph: (a) $y = 1/x$; (b) $y = e^x$.
16. General nature of the graphs of circles, parabolas, ellipses, and hyperbolas. Sketch each of the following (with appropriate points like vertices): (a) $x^2+y^2 = 9$; (b) $(x-1)^2 = 8(y+1)$; (c) $x^2/4 + (y-2)^2/9 = 1$; (d) $(y+2)^2/4 - x^2 = 1$.
17. Graphing systems of inequalities. Graph: $\begin{cases} x^2+y^2 \leq 36 \\ 4x^2-9y^2 \geq 36 \end{cases}$.

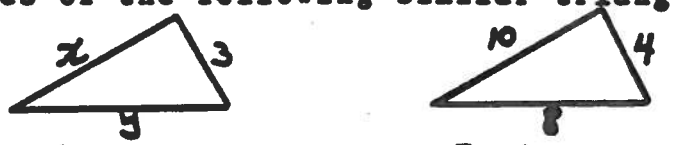
TRIGONOMETRY SKILLS

1. Relationship between radians and degrees. π radians = _____ degrees
2. Right-triangle definitions of the six trigonometric functions. Find the values of the six trigonometric functions of θ in:

3. Coordinate-axes definitions of the six trigonometric functions. Find the values of the six trigonometric functions of θ in standard position if the terminal side contains (1,2).
4. Reciprocal relationships of trigonometric functions. (a) $1/\sin\theta$ = (b) $1/\cos\theta$ = ? (c) $1/\tan\theta$ = ?
5. $\tan\theta = \sin\theta/\cos\theta$ and $\cot\theta = \cos\theta/\sin\theta$. If $\sin\theta = 1/2$ and $\cos\theta = \sqrt{3}/2$, find: (a) $\tan\theta$; (b) $\cot\theta$.
6. Values of trigonometric functions of special triangles. Evaluate without a calculator: (a) $\sin 30^\circ$; (b) $\cos(5\pi/4)$; (c) $\tan 120^\circ$; (d) $\sec(5\pi/3)$.
7. Values of trigonometric functions of quadrantal angles. Evaluate without a calculator: (a) $\cot 90^\circ$; (b) $\csc(3\pi/2)$; (c) $\sin 540^\circ$; (d) $\cos 4\pi$.
8. Pythagorean identities. Verify the follwing identities:
   (a) $\sin^2 A \cdot \cot^2 A = (1-\sin A)(1+\sin A)$;
   (b) $1+\tan^2(90^\circ - x) = 1/\left[\cos^2(90^\circ - x)\right]$.
9. Identities for $\sin 2\theta$, $\cos 2\theta$, and $\tan 2\theta$. If the terminal side of an angle in standard position contains (7,24), find: (a) $\sin 2\theta$; (b) $\cos 2\theta$; (c) $\tan 2\theta$.
10. Relationship of trigonometric function to cofunction of its complement. (a) $\sin(90^\circ - \theta) = ?$ (b) $\tan(\pi/2 - \theta) = ?$ (c) $\sec(90^\circ - \theta) = ?$
11. Graphing trigonometric functions using amplitude, period and phase shift. Graph a $\sin\theta$ function whose amplitude = 3, period = 180° , and phase shift = 90° .
12. Graphing trigonometric functions using tables of values. Use a table of values to graph $y = 2\cos(\theta+45^\circ)$.
13. Principal values of inverse trigonometric functions. Find (without a calculator) the following principal values: (a) $\mathrm{Sin}^{-1}(1/2)$;
    (b) $\mathrm{Cos}^{-1}(-\sqrt{3}/2)$; (c) Arc tan -1.
14. Solving trigonometric equations. Solve the following for $0 \leq \theta < 2\pi$: (a) $\cos^2\theta - \cos\theta - 2 = 0$; (b) $\tan^2\theta - \tan\theta = 1$.
15. Graphing of polar coordinates. Graph the following pairs of polar coordinates: (a) $(3, 120^\circ)$; (b) $(-1, \pi/4)$; (c) $(-2, 180^\circ)$.
16. Conversion from rectangular coordinates to polar coordiantes (and vice versa). (a) Convert $(1, \sqrt{3})$ to polar coordinates; (b) Convert $(2, 150^\circ)$ to rectangular coordinates.
17. Graphs of polar-coordinate equations. Graph: (a) $r = 1+2\cos\theta$; (b) $r = -2\cos 2\theta$.

GEOMETRY SKILLS

1. Pythagorean Theorem. Find the hypotenuse of a right triangle if the two legs are 5 and 7.
2. Similar triangles (corresponding sides proportional). Find the missing sides of the following similar triangles:



3. Perpendicular-bisector property. Find the equation of the set of points which are equidistant from (2,4) and (0,2).
4. Perimeter and area formulas for squares and rectangles. Find the perimeter and area of: (a) a square whose side = 8cm. ; (b) a rectangle whose sides are 9in. and 5in.
5. Area formula for trapezoids. Find the area of a trapezoid whose bases are 4mm. and 8mm. and whose altitude = 6mm.
6. Circumference and area formulas for circles. Find the circumference and area of a circle whose radius = 6in.
7. Volume and surface area formulas for rectangular solids. Find the surface area and volume of a rectangular solid whose dimensions are 6x4x2.
8. Volume and surface area formulas for spheres. Find the surface area and volume of a sphere whose radius = 4cm.
9. Sketch right-circular cones and cylinders. (a) Sketch a right-circular cone whose radius = 8in. and whose height = 6in. ; (b) The same as part (a) for a circular cylinder.
10. Volume and surface area formulas for cylinders. Find the surface area and volume of the cylinder in 9(b).
11. Volume formula for right circular cones. Find the volume of the cone in 9(a).

CALCULATOR SKILLS

1. Basic operations. Evaluate: (a) 432+68; (b) 689-284; (c) $4804 \cdot 30496$; (d) $384/27$; (e) the reciprocal of 62.
2. Exponential and root functions. Evaluate: (a) 42^{12}; (b) 32^2 ; (c) $\sqrt{28}$; (d) $\sqrt[3]{39}$.
3. Calculate using algebraic logic. If $f(x) = 2x^3-6x^2-7x+8$, find $f(3.4)$.
4. Complicated computations. If $A = P(1+r/n)^{nt}$, P = \$2000, r = .08, n = 4, and t = 10, find A.
5. Storage of partial answers and complicated constants in memory. Use "memory" to do the following as quickly as possible. Assume $x = (24 \cdot 38)^{1/5}$. (a) x^{24} ; (b) $3x^2 - \sqrt{x}$.
6. Successive calculations of f(x). If $f(x) = x^3-6x+7$, find: (a) f(2.1) ; (b) f(2.01) ; (c) f(2.001) ; (d) f(2.0001) .
7. Parentheses. Use parentheses to find: (a) $\dfrac{6}{7 + 8.6}$;

   (b) $\dfrac{3.4}{6.9\sqrt{3.2}}$.
8. Trigonometric functions (in degrees). Evaluate: (a) sin 27° ; (b) cos $126^\circ 14'$; (c) tan $-24^\circ 10'$.
9. Trigonometric functions (in radians). Evaluate: (a) $\csc(\pi/5)$; (b) $\sec(2\pi/3)$; (c) $\cot(-\pi/7)$.
10. Inverse trigonometric functions. Evaluate: (a) Arc sin .2; (b) Arc cos -.3589; (c) Tan^{-1} .9 ; (d) Arc cot .1 ; (e) Arc sec 1.1; (f) Csc^{-1} 6.
11. Logarithmic function (base e and base 10). Evaluate: (a) log 3486 (b) ln 604; (c) $\log_{27} 38$.

ANSWERS and SELECTED SOLUTIONS

ALGEBRA SKILLS

1) F

2) (a) 

(b) 

3) (a) T (b) T (c) T (d) T

4) infinite

5) 0

6) (a) $2x+7 > 4x-8$

$-2x > -15$

$x < \frac{15}{2}$

(b) $x \geq \frac{-17}{3}$

7) (a) $\sqrt{13}$ (b) $2/3$ (c) $(-\frac{1}{2}, -3)$

8) (a) $y = \frac{2}{3}x + b$

$-2 = \frac{2}{3} \cdot 1 + b$

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

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

(b) $y+2 = \frac{2}{3}(x-1)$

9) So slope also $= \frac{2}{3}$.

$y = \frac{2}{3}x + \frac{11}{3}$

10) Slope $= -\frac{3}{2}$

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

ALGEBRA

11) (a) $2x(2x^2-3x-4)$ (b) $(3x-4)(3x+4)$

(c) $3x(x^2-3x-10)$
$3x(x-5)(x+2)$

(d) $(3x-7)(2x+5)$

12) $x^2-8x+12$
$(x^2-8x+16)+12-16$
$(x-4)^2-4$

13) (a) $x=9$ or 6 (b) $x=\frac{6\pm\sqrt{(-6)^2-4(2)(-7)}}{2(2)}$

$x=\frac{3\pm\sqrt{23}}{2}\approx 3.9$ or $-.9$

14) $x(6x^3-23x^2+9x+18)=0$

$\frac{p}{q}=\pm1,\pm2,\pm3,\pm6,\pm9,\pm18,\pm\frac{1}{2},\pm\frac{3}{2},\pm\frac{9}{2},\pm\frac{1}{3},\pm\frac{2}{3},\pm\frac{1}{6}$

$x=\left\{0,3,\frac{3}{2},-\frac{2}{3}\right\}$

15) (a) $\sqrt{x+3}=x+1$
$x+3=(x+1)^2$
$x+3=x^2+2x+1$
$0=x^2+x-2$
$0=(x+2)(x-1)$
$x=-2$ or 1

Final answer: $x=1$

(b) $\sqrt[3]{x}=x$
$x=x^3$
$0=x^3-x$
$0=x(x^2-1)$
$0=x(x-1)(x+1)$
$x=0$ or 1 or -1

ALGEBRA

28) (a) T (b) F

29) $x - \frac{x}{x^2+1}$

30) (a) $x^3+9x^2+21x+9$ (b) $x^2-10x+25$

31) (a) $\frac{2x}{(x+3)(x-3)}$ (b) $\frac{3-x}{(x+2)(x-2)}$

32) (a) 0 (b) 1

33) (a) $3^4 = 81$ (b) $\log_5 25 = 2$

34) (a) $\log_4[(x-3)(x+3)] = 2$

$x^2 - 9 = 4^2$

$x^2 = 25$

$x = 5, -5$

Final answer: $x = 5$

(b) $\frac{1}{2}$ (c) $x \log_7 7 = 14.5$

$x = 14.5$

35) (a) 2.718 (b) 1 (c) $2 \ln e = 2$

36) (a) $2+5+10+17+26 = 60$

(b) $4 \cdot 8 = 32$

37) 30 m.p.h.

38) (a) $5+i$ (b) $11-2i$ (c) $17-28i$

(d) $\frac{5+2i}{3-i} \cdot \frac{3+i}{3+i} = \frac{13+11i}{10} = \frac{13}{10} + \frac{11}{10}i$

39) $\frac{3 \pm i\sqrt{31}}{4}$

ALGEBRA

16) (a) $(1,-3)$ (b) $(-y+3)+4y^2=36$

$4y^2-y-33=0$

$(4y+11)(y-3)=0$

$y=-\frac{11}{4}$ or 3

$(0,3)\ \left(\frac{\sqrt{133}}{2},-\frac{11}{4}\right)\left(-\frac{\sqrt{133}}{2},-\frac{11}{4}\right)$

17) (a) 9 (b) $2(3x)^2-3(3x)+7=18x^2-9x+7$

18) (a) $f(g(x))=f(x+4)=\sqrt{x+4}$

(b) $\sqrt{x}+4$

19) (a) T (b) F

20) $\frac{(x+6)(x+2)}{x(x-2)(x+2)}=\frac{x+6}{x(x-2)}$

21) $\frac{x+\sqrt{x}}{x-1}\cdot\frac{x-\sqrt{x}}{x-\sqrt{x}}=\frac{x^2-x}{(x-1)(x-\sqrt{x})}=\frac{x(x-1)}{(x-1)(x-\sqrt{x})}=\frac{x}{x-\sqrt{x}}$

22) 3

23) $\frac{3-\frac{6}{x}+\frac{7}{x^2}}{4+\frac{1}{x}-\frac{6}{x^2}}$

24) (a) T (b) F

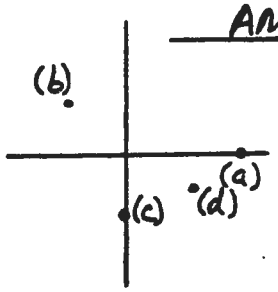
25) $\frac{x+1}{x-1}$

26) (a) x^{11} (b) x^7 (c) x^7y^{18}

27) (a) T (b) F

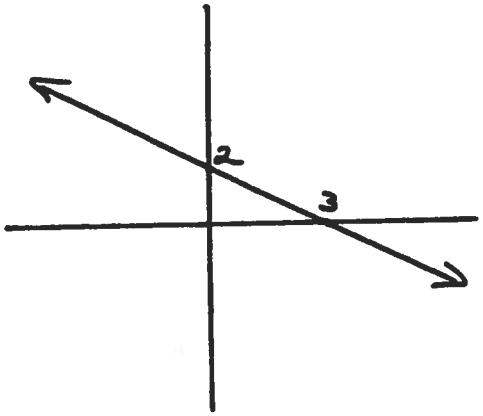
ANALYTIC GEOMETRY SKILLS

1)

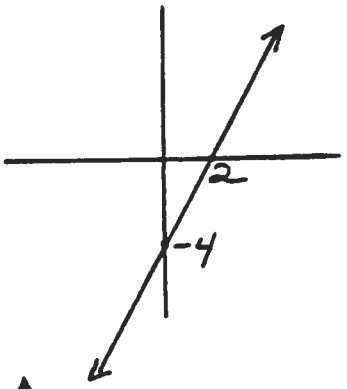


2)

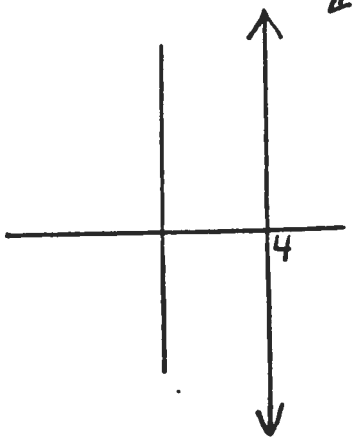
x	y
0	2
3	0
6	-2
-3	4



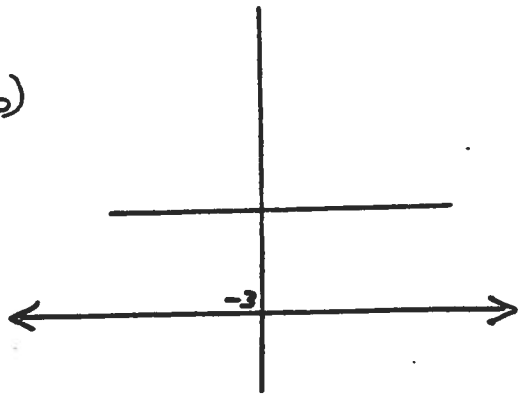
3) $y = 2x - 4$



4) (a)



(b)



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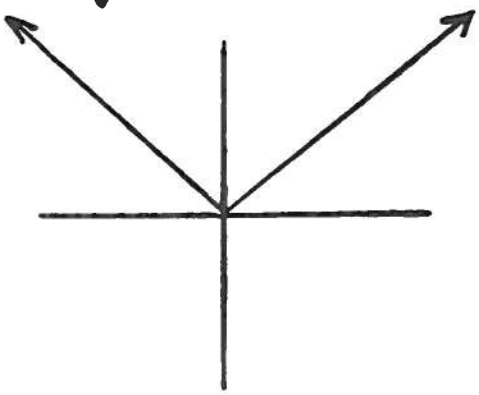
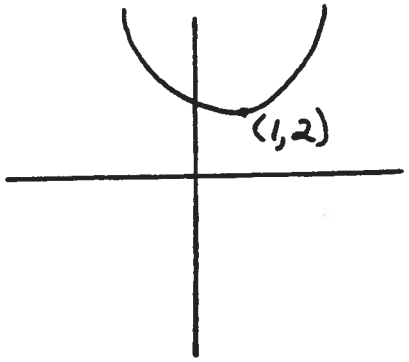


ANALYTIC GEOMETRY

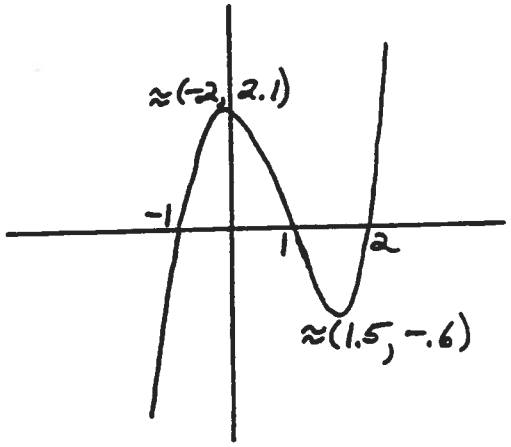
6)

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



7) Use synthetic division:

	1	-2	-1	2
3	1	1	2	8
2	1	0	-1	0
1	1	-1	-2	0
0	1	-2	-1	2
-1	1	-3	2	0



8) x-intercept

$0 = x^2 + x - 6$

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

$x = -3$ or 2

y-intercept

$y = 0^2 + 0 - 6$

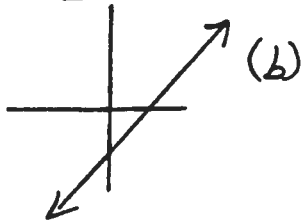
$y = -6$

9) $y = -\frac{3}{5}x + \frac{7}{5}$

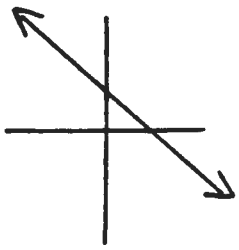
$m = -\frac{3}{5}$

10) $m = \frac{5}{3}$

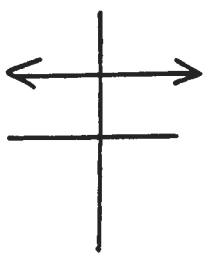
11) (a)



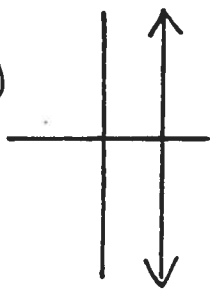
(b)



(c)



(d)



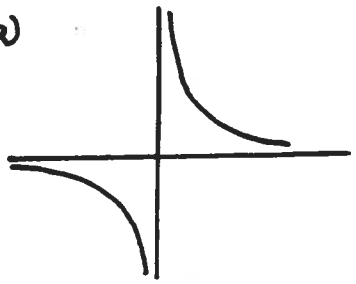
ANALYTIC GEOMETRY

12) (a) straight line (b) parabola (c) circle
(d) ellipse (e) hyperbola

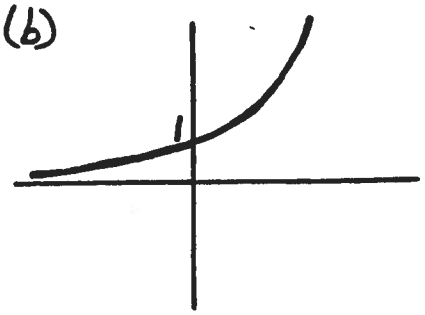
13) (a) yes (b) no

14) Domain: $x \geq 3$ or $x \leq -3$. Range: $y \geq 0$

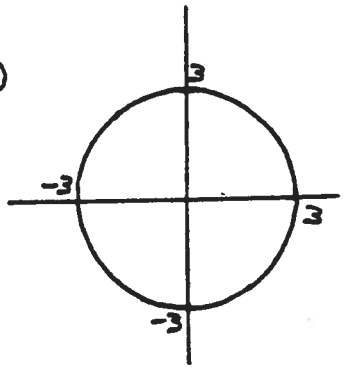
15) (a)



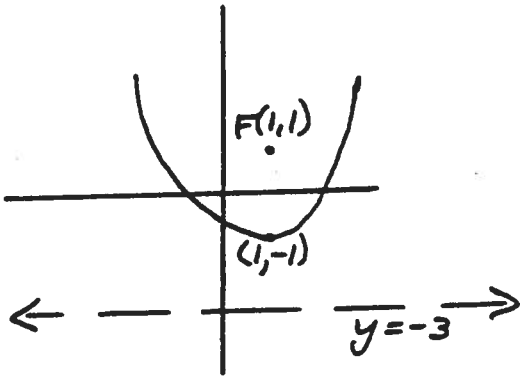
(b)



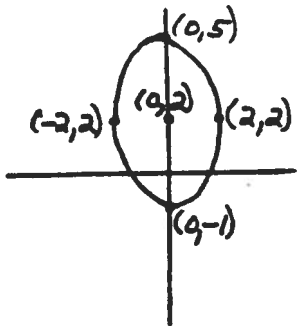
16) (a)



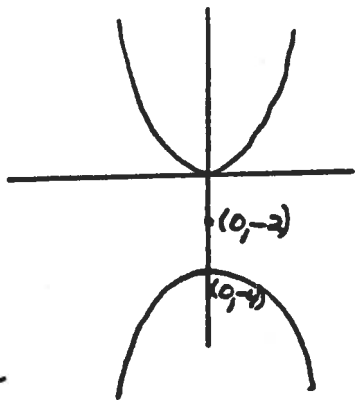
(b)



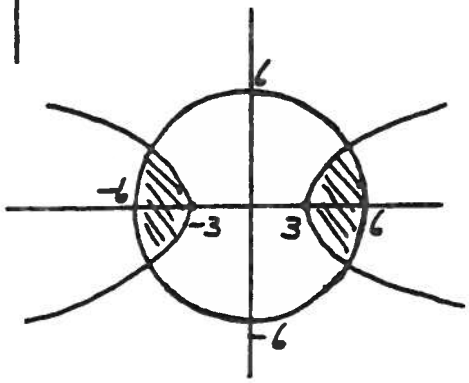
(c)



(d)



17)



TRIGONOMETRY SKILLS

1) 180

2) $r=13$ $\sin\theta=\frac{5}{13}$ $\cos\theta=\frac{12}{13}$ $\tan\theta=\frac{5}{12}$
$\cot\theta=\frac{12}{5}$ $\sec\theta=\frac{13}{12}$ $\csc\theta=\frac{13}{5}$

3) $r=\sqrt{5}$ $\sin\theta=\frac{2}{\sqrt{5}}$ $\cos\theta=\frac{1}{\sqrt{5}}$ $\tan\theta=2$
$\cot\theta=\frac{1}{2}$ $\sec\theta=\sqrt{5}$ $\csc\theta=\frac{\sqrt{5}}{2}$

4) (a) $\csc\theta$ (b) $\sec\theta$ (c) $\cot\theta$

5) (a) $\frac{1}{\sqrt{3}}$ (b) $\sqrt{3}$

6) (a) $\frac{1}{2}$ (b) $-\frac{1}{\sqrt{2}}$ (c) $-\sqrt{3}$ (d) 2

7) (a) 0 (b) -1 (c) 0 (d) 1

8) (a) $\sin^2 A \cdot \frac{\cos^2 A}{\sin^2 A} = 1-\sin^2 A$
$\cos^2 A = \cos^2 A$

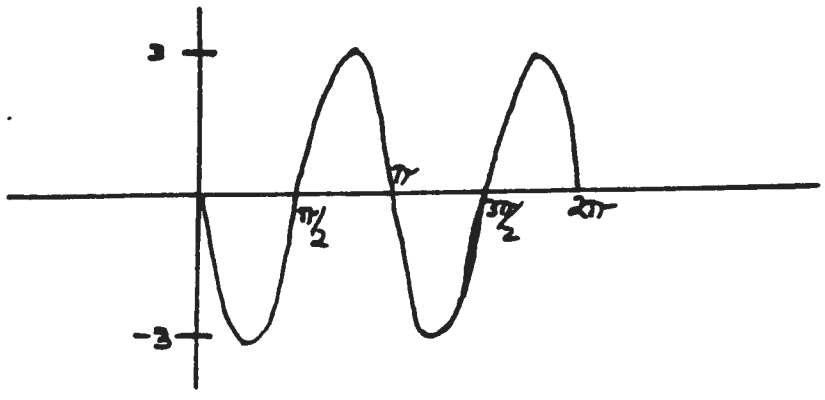
(b) $\sec^2(90^\circ-x)=\sec^2(90^\circ-x)$

9) $r=25$ (a) $\sin 2\theta = 2\sin\theta\cos\theta$
$=2\left(\frac{24}{25}\right)\left(\frac{7}{25}\right)$
$=\frac{336}{625}$

(b) $\frac{-527}{625}$ (c) $\frac{-336}{527}$

10) (a) $\cos\theta$ (b) $\cot\theta$ (c) $\csc\theta$

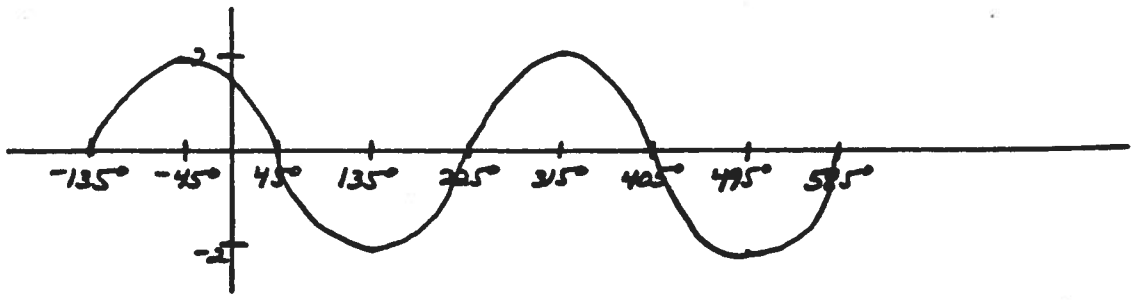
11)



TRIGONOMETRY

12)

θ	y
$-45°$	2
$45°$	0
$135°$	-2
$225°$	0
$315°$	2



13) (a) $\frac{\pi}{6}$ (b) $\frac{5\pi}{6}$ (c) $-\pi/4$

14) (a) $(\cos\theta - 2)(\cos\theta + 1) = 0$

$\cos\theta = 2 \Rightarrow$ no values

$\cos\theta = -1 \Rightarrow \pi$

(b) $\tan^2\theta - \tan\theta - 1 = 0$

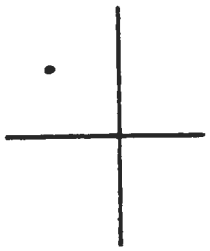
$$\tan\theta = \frac{1 \pm \sqrt{(-1)^2 - 4(1)(-1)}}{2(1)}$$

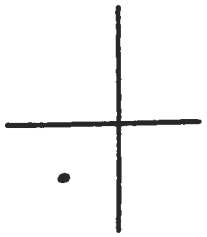
$$\tan\theta = \frac{1 \pm \sqrt{5}}{2}$$

$\tan\theta \approx 1.6$ or $-.6$

$\theta \approx 58.3°$ or $238.3°$

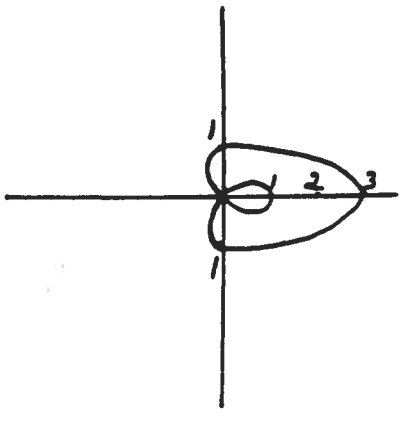
$\theta \approx 148.3°$ or $328.3°$

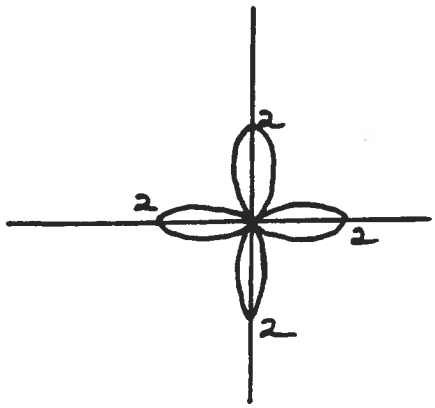
15) (a) 

(b) 

(c) 

16) (a) $(2, \pi/3)$ (b) $(-\sqrt{3}, 1)$

17) (a) 



GEOMETRY SKILLS

1) $\sqrt{74}$

2) $\frac{x}{10} = \frac{3}{4}$ $\qquad$ $\frac{y}{8} = \frac{3}{4}$

$4x = 30$ $\qquad$ $4y = 24$

$x = 7.5$ $\qquad$ $y = 6$

3) **METHOD 1**

$m = 1$

$m_\perp = -1$

$y = -x + b$

Midpoint $= (1, 3)$

$\therefore 3 = -1 + b$

$4 = b$

$\therefore y = -x + 4$

METHOD 2

$$\sqrt{(x-2)^2+(y-4)^2} = \sqrt{(x-0)^2+(y-2)^2}$$

$$x^2 - 4x + 4 + y^2 - 8y + 16 = x^2 + y^2 - 4y + 4$$

$$-4x + 16 = 4y$$

$$-x + 4 = y$$

4) (a) perimeter $= 32\text{ cm}$; area $= 64\text{ cm}^2$

(b) perimeter $= 28\text{ in}$; area $= 45\text{ in}^2$

5) $A = \frac{1}{2}(6)(4+8) = 36\text{ mm}^2$

6) $C = 12\pi\text{ in} \approx 37.7\text{ in}$; $A = 36\pi\text{ in}^2 \approx 113.1\text{ in}^2$

7) Surface area $= 88$; Volume $= 48$

8) $A = 4\pi \cdot 16 = 64\pi\text{ cm}^2 \approx 201.1\text{ cm}^2$

$V = \frac{4}{3}\pi \cdot 64 = \frac{256\pi}{3}\text{ cm}^3 \approx 268.1\text{ cm}^3$

9) (a)

(b)

10) $A = 2\pi \cdot 8 \cdot 6 + 2(\pi \cdot 8^2) = 96\pi + 128\pi = 224\pi\text{ in}^2 \approx 703.7\text{ in}^2$

$V = \pi \cdot 8^2 \cdot 6 = 384\pi\text{ in}^3 \approx 1206.4\text{ in}^3$

11) $V = \frac{1}{3}\pi \cdot 8^2 \cdot 6 = 128\pi\text{ in}^3 \approx 402.1\text{ in}^3$

CALCULATOR SKILLS

1) (a) 500 (b) 405 (c) 146,502,784 (d) $14.\overline{2}$ (e) $\approx .02$

2) (a) $\approx 3.01(10^{19})$ (b) 1024 (c) ≈ 5.29 (d) ≈ 3.39

3) -6.552

4) $\approx \$4416.08$

5) (a) $\approx 1.61(10^{14})$ (b) ≈ 43.85

6) (a) 3.661 (b) ≈ 3.06 (c) ≈ 3.01 (d) ≈ 3.0006

7) (a) $\approx .38$ (b) $\approx .28$

8) (a) $\approx .4540$ (b) $\approx .5911$ (c) $\approx -.4487$

9) (a) ≈ 1.7013 (b) -2 (c) ≈ -2.0765

10) (a) $\approx 11.54°$ or $\approx .20$ radians
(b) $\approx 111.03°$ or ≈ 1.94 radians
(c) $\approx 41.99°$ or $\approx .73$ radians
(d) $\approx 84.29°$ or ≈ 1.47 radians
(e) $\approx 24.62°$ or $\approx .43$ radians
(f) $\approx 9.59°$ or $\approx .17$ radians

11) (a) $\log 3486 \approx 3.54$

(b) ≈ 6.40

(c) $\log_{27} 38 = \frac{\log 38}{\log 27} \approx 1.10$