

FALL 2018

**Simplify. Write the results in the form  $a+bi$** 

1)  $-4i - (5 + 5i) - 3$

2)  $3 + 4i - 5 - 3i$

3)  $-4 + 2i - 3 - i$

4)  $(-2 - 3i)(-5 + 5i)$

**Simplify.**

5)  $\frac{1}{-10i}$

6)  $\frac{2 - 9i}{8 + 7i}$

7)  $\frac{2i}{9 - 7i}$

**Evaluate each function.**

8)  $p(x) = 4x + 5$ ; Find  $p(-8)$

9)  $f(t) = t^2 - 1$ ; Find  $f(7)$

10)  $f(n) = -4n - 4$ ; Find  $f(n + 4)$

11)  $g(x) = x^2 - 4x$ ; Find  $g(3x)$

**Perform the indicated operation.**

12)  $f(x) = 4x + 2$   
 $g(x) = 2x + 1$   
Find  $\frac{f}{g}$

13)  $g(x) = 4x + 5$   
 $f(x) = -4x + 1$   
Find  $f - g$

14)  $g(x) = 3x + 4$   
 $f(x) = 3x^2 + 4x$   
Find  $(g + f)(1)$

15)  $h(n) = 4n + 2$   
 $g(n) = n^2 - 3$   
Find  $hg(0)$

16)  $f(n) = 2n - 1$   
 $g(n) = n^3 + 5n^2$   
Find  $(f \circ g)(n)$

17)  $h(x) = -3x^2 + 2x$   
Find  $(h \circ h)(x)$

Identify the domain.

18)  $y = \sqrt{x} + 1$

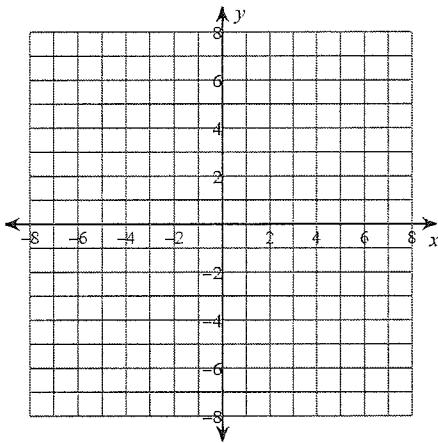
19)  $y = \sqrt{x+3}$

20)  $f(x) = \frac{x^3 - 4x}{x^3 - x^2 - 2x}$

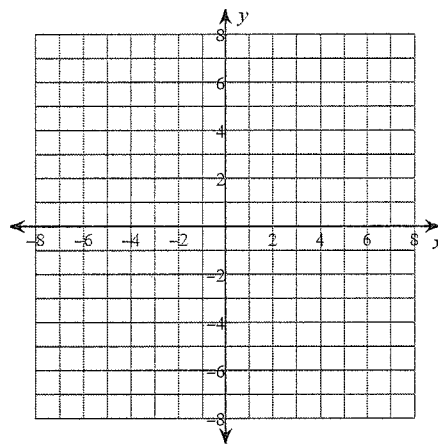
21)  $f(x) = \frac{x^2 + 2x}{4x^2 + 4x - 24}$

Sketch the graph of each function.

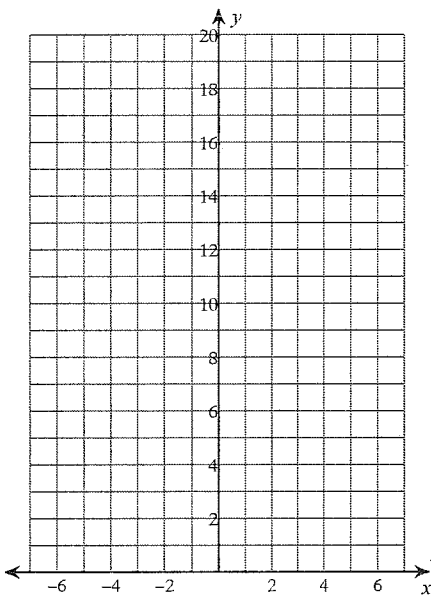
22)  $f(x) = 2x^2 - 8x + 2$



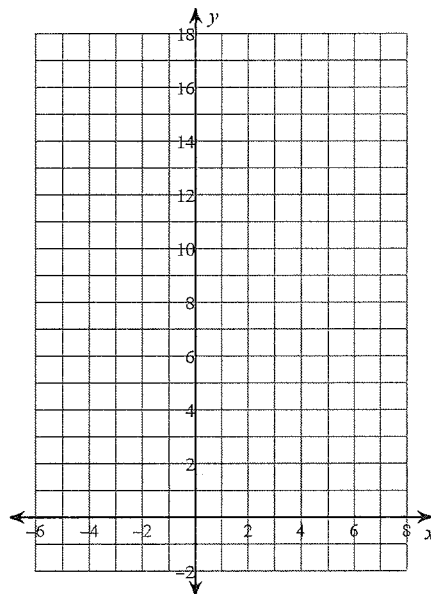
23)  $f(x) = \begin{cases} -4, & x \leq -2 \\ 1, & x > -2 \end{cases}$



24)  $f(x) = \left(\frac{1}{2}\right)^x$



25)  $f(x) = 3^{x-1} - 2$



For each problem, find the average rate of change of the function over the given interval.

26)  $f(x) = x^2 - 2$ ;  $[-2, 4]$

27)  $f(x) = x^2 - 2x + 2$ ;  $[1, 2]$

Describe the transformations necessary to transform the graph of  $f(x)$  into that of  $g(x)$ .

28)  $f(x) = x^3$   
 $g(x) = 3x^3 - 3$

29)  $f(x) = x^2$   
 $g(x) = -x^2 - 3$

30)  $f(x) = |x|$   
 $g(x) = -|x + 5| - 2$

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

Find the inverse of each function.

32)  $f(x) = \frac{2}{x + 1} - 1$

33)  $g(x) = -4 - \frac{1}{2}x$

Rewrite each equation in exponential form.

34)  $\log_{\frac{1}{11}} \frac{1}{121} = 2$

35)  $\log_{121} 11 = \frac{1}{2}$

36)  $\log_{15} 225 = 2$

37)  $\log_7 \frac{1}{49} = -2$

Rewrite each equation in logarithmic form.

38)  $9^{-2} = \frac{1}{81}$

39)  $19^y = x$

40)  $16^x = y$

41)  $x^y = 140$

Evaluate each expression.

42)  $\log_7 \frac{1}{343}$

43)  $\log_6 36$

44)  $\log_9 3$

45)  $\log_8 2$

Use a calculator to approximate each to three decimal places.

46)  $\log_6 34$

47)  $\log_{59} 4$

Solve each equation.

48)  $\log_{15} (-3n - 1) = \log_{15} -2n$

49)  $\log_{19} (9 - 2m) = \log_{19} (-m + 10)$

50)  $\log_2 3 + \log_2 (x^2 - 2) = 2$

51)  $\log_8 (x + 6) - \log_8 x = 1$

52)  $\log_3 4 + \log_3 (x - 7) = 2$

53)  $\log_9 3x^2 + \log_9 3 = 5$

Condense each expression to a single logarithm.

54)  $\log_5 z + \frac{\log_5 x}{3} + \frac{\log_5 y}{3}$

55)  $\frac{\log_2 x}{2} + \frac{\log_2 y}{2} + \frac{\log_2 z}{2}$

56)  $2\log_7 x - 4\log_7 y$

57)  $6\log_5 x + 24\log_5 y$

Expand each logarithm.

58)  $\log_6 (uv^6)^2$

59)  $\log_2 (x^4 y^5)$

60)  $\log_8 (a \cdot b \cdot c^4)$

61)  $\log_6 \left(\frac{a}{b^5}\right)^6$

Solve each equation. Round your answers to four decimal places.

62)  $15^{-4r} + 1 = 77$

63)  $-4 \cdot 13^{-4a} = -68.5$



Convert each radian measure into degrees.

74)  $\frac{149\pi}{36}$

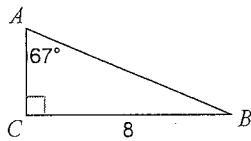
75)  $\frac{29\pi}{12}$

76)  $\frac{10\pi}{9}$

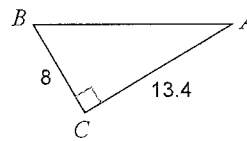
77)  $\frac{2\pi}{3}$

Solve each triangle. Round answers to one decimal place.

78)



79)



80) The base of a ladder is 6 ft from the building, and the angle formed by the ladder and the ground is  $73^\circ$ . How high up the building does the ladder touch?

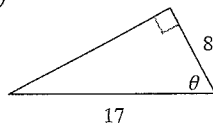
81) A 96-ft tree casts a shadow that is 120 ft long. What is the angle of elevation of the sun?

Find the value of the trig function indicated.  $\theta$  is in quadrant 1.

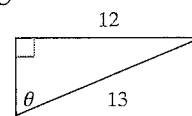
82) Find  $\tan \theta$  if  $\csc \theta = \frac{25}{24}$

83) Find  $\sec \theta$  if  $\cos \theta = \frac{\sqrt{15}}{4}$

84)  $\tan \theta$



85)  $\sin \theta$



Find the exact value of each trigonometric function.

86)  $\sin 900^\circ$

87)  $\csc \frac{19\pi}{4}$

88)  $\cos 660^\circ$

89)  $\tan 1050^\circ$

90)  $\sin\left(-\frac{10\pi}{3}\right)$

91)  $\cos(-240^\circ)$

92)  $\sec 600^\circ$

93)  $\cos -\frac{11\pi}{3}$

94)  $\tan 690^\circ$

95)  $\sin\left(-\frac{16\pi}{3}\right)$

Find the amplitude, the period, the phase shift, and the vertical shift. Then sketch one period of the graph.

96)  $y = 4\sin\left(2\theta - \frac{\pi}{2}\right)$

97)  $y = \cos\left(\theta - \frac{\pi}{2}\right)$

98)  $y = \frac{1}{2} \cdot \tan \frac{\theta}{2}$

99)  $y = \sec 2\theta$

Graph each function using radians.

100)  $y = 2\cos\left(4\theta + \frac{\pi}{2}\right) + 2$

Find the exact value of each expression.

101)  $\tan^{-1} \sqrt{3}$

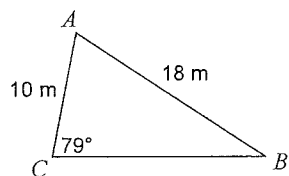
102)  $\sin^{-1} -\frac{1}{2}$

103)  $\sec(\arctan 5/4)$

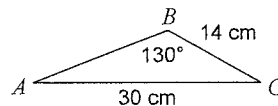
104)  $\cos(\arcsin 5/13)$

Find each measurement indicated. Round your answers to the one decimal place.

105) Find  $m\angle B$



106) Find  $m\angle A$



Solve each triangle. Round your answers to the nearest tenth.

107)  $m\angle B = 139^\circ$ ,  $m\angle A = 34^\circ$ ,  $c = 5$

108)  $m\angle B = 22^\circ$ ,  $a = 33$ ,  $b = 27$

109)  $m\angle B = 81^\circ$ ,  $a = 32$ ,  $b = 9$

110)  $m\angle A = 54^\circ$ ,  $m\angle C = 94^\circ$ ,  $c = 32$

111)  $b = 24$ ,  $a = 18$ ,  $c = 26$

112)  $m\angle A = 77^\circ$ ,  $b = 17$ ,  $c = 15$

Verify each identity.

113)  $\frac{\sin x + \sec x}{\sec x} = \sin x \cos x + 1$

114)  $\tan x + \sec x = \frac{\sin x + 1}{\cos x}$

115)  $\frac{\sin(x+y) + \sin(x-y)}{\cos(x+y) + \cos(x-y)} = \tan x$

116)  $(\sin x + \cos x)^2 = 1 + 2\sin x \cos x$

117)  $\frac{1}{1 - \sin^2 x} = 1 + \tan^2 x$

Find the exact value of each.

118)  $\sin 195^\circ$

119)  $\cos 75^\circ$

120)  $\tan x = \frac{4}{3}$  where  $0 \leq x < 90^\circ$

121)  $\cos x = \frac{4}{5}$  where  $270^\circ < x < 360^\circ$

Find a)  $\sin 2x$ , b)  $\cos 2x$ , c)  $\tan 2x$

Find a)  $\sin \frac{x}{2}$ , b)  $\cos \frac{x}{2}$ , c)  $\tan \frac{x}{2}$

122)  $\cos 22.5^\circ$



Find all solutions to each equation.

123)  $\sin \theta \cdot (\cos \theta - 2) = 0$

124)  $4 + 3 \tan \theta = 7$

125)  $\cos \theta = -\frac{1}{3}$

126)  $2 \sin^2 \theta = -2 \sin \theta + 3 \sin^2 \theta + 1$

127)  $2 \cos 2\theta + 1 = 0$

Plot the point with the given polar coordinates.

128)  $\left(-2, \frac{11\pi}{12}\right)$

129)  $\left(1, \frac{5\pi}{4}\right)$

Convert each pair of polar coordinates to rectangular coordinates.

130)  $\left(3, -\frac{3\pi}{4}\right)$

131)  $\left(4, -\frac{\pi}{6}\right)$

Convert each pair of rectangular coordinates to polar coordinates where  $r > 0$  and  $0 \leq \theta < 2\pi$ .

132)  $\left(-\frac{3\sqrt{3}}{2}, -\frac{3}{2}\right)$

133)  $\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

Convert each equation from rectangular to polar form.

134)  $y = \frac{x}{5}$

135)  $x^2 + y^2 = 9$

Convert each equation from polar to rectangular form.

136)  $r = -6 \cos \theta - 2 \sin \theta$

137)  $\tan \theta = 4$

Find the modulus (absolute value).

138)  $-6 + 6i$

139)  $-3 - 3i\sqrt{3}$

Plot each point in the complex plane.

140)  $-5 + 4i$

141)  $5 + 3i$

Write each in polar form.

142)  $-4i$

143)  $3\sqrt{3} - 3i$

Simplify. Write your answer in rectangular form.

144)  $(-2 - 2i)^4$

145)  $(3 + 5i)^3$

Find the component form of the resultant vector.

146)  $\mathbf{a} = \langle -1, 0 \rangle$   
Find:  $-8\mathbf{a}$

147)  $\mathbf{u} = \langle 14, 48 \rangle$   
Find:  $-7\mathbf{u}$

148)  $\mathbf{f} = \langle -11, -2 \rangle$   
 $\mathbf{v} = \langle -2, -12 \rangle$   
Find:  $\mathbf{f} + \mathbf{v}$

149)  $\mathbf{a} = \langle 8, -9 \rangle$   
 $\mathbf{g} = \langle 7, -2 \rangle$   
Find:  $\mathbf{a} - \mathbf{g}$

Find the magnitude and direction angle for each vector.

150)  $\mathbf{b} = \langle 48, -34 \rangle$

151)  $\mathbf{n} = \langle 12, 22 \rangle$

152)  $\mathbf{k} = \langle -1, -2\sqrt{30} \rangle$

Find the dot product of the given vectors.

153)  $\mathbf{u} = \langle -7, -3 \rangle$   
 $\mathbf{v} = \langle -2, -2 \rangle$

154)  $\mathbf{u} = \langle 9, -6 \rangle$   
 $\mathbf{v} = \langle 6, 5 \rangle$

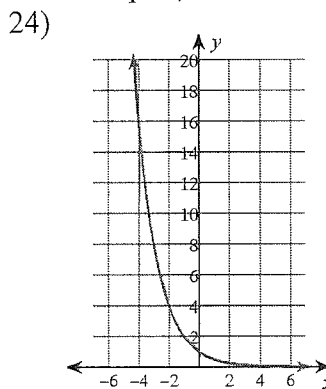
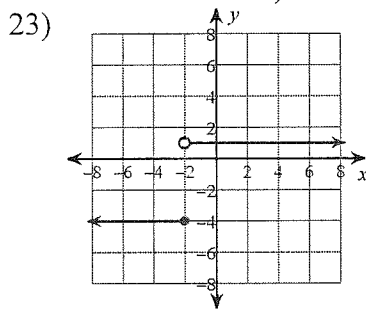
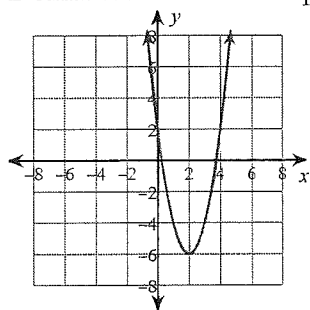
Find the measure of the angle between the two vectors.

155)  $\mathbf{u} = \langle 0, -7 \rangle$   
 $\mathbf{v} = \langle 8, 6 \rangle$

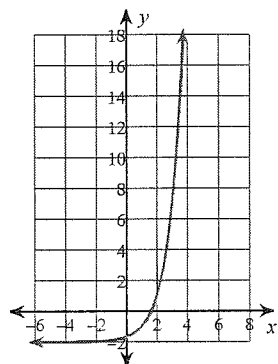
156)  $\mathbf{u} = \langle -7, 5 \rangle$   
 $\mathbf{v} = \langle 0, 8 \rangle$

## Answers to FALL 2018

- 1)  $-8 - 9i$       2)  $-2 + i$       3)  $-7 + i$       4)  $25 + 5i$   
 5)  $\frac{i}{10}$       6)  $\frac{-47 - 86i}{113}$       7)  $\frac{-7 + 9i}{65}$       8)  $-27$   
 9) 48      10)  $-4n - 20$       11)  $9x^2 - 12x$       12)  $\frac{4x + 2}{2x + 1}$   
 13)  $-8x - 4$       14) 14      15)  $-6$       16)  $2n^3 + 10n^2 - 1$   
 17)  $-27x^4 + 36x^3 - 18x^2 + 4x$       18) Domain:  $x \geq 0$       19) Domain:  $x \geq -3$   
 20) Domain: All reals except  $-1, 0, 2$       21) Domain: All reals except  $2, -3$   
 22)



- 25)      26) 2      27) 1

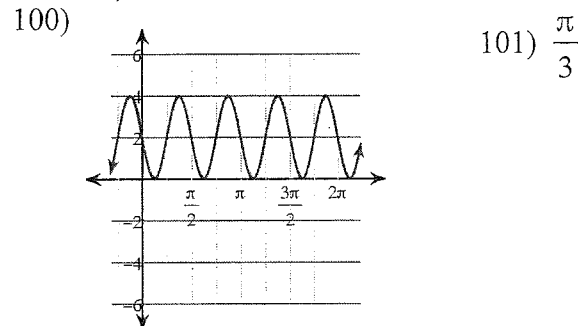
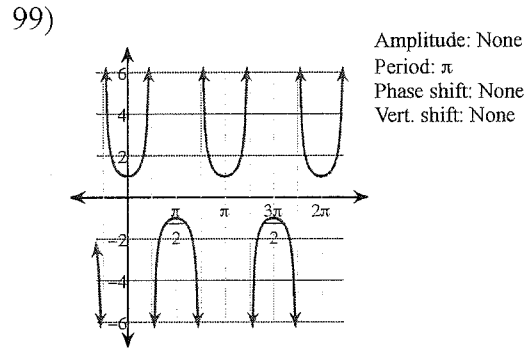
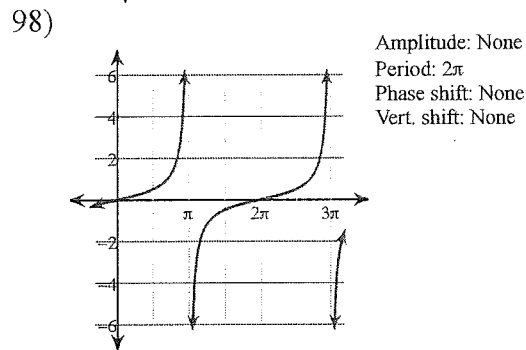
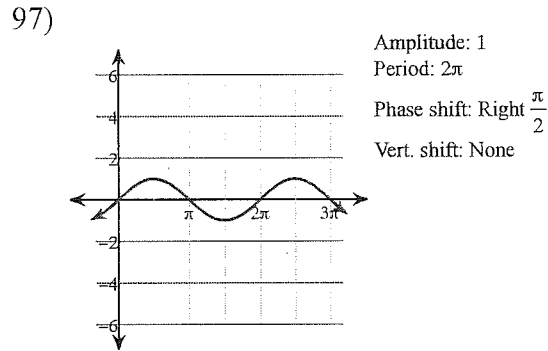
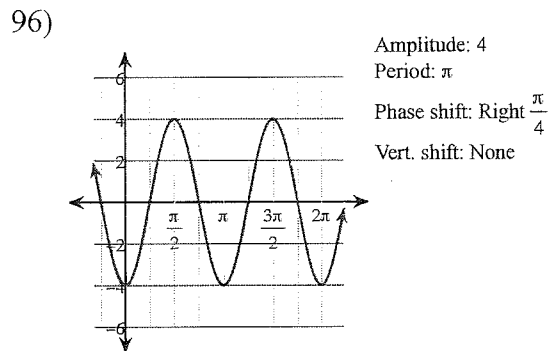


- 28) compress horizontally by a factor of 3  
 translate down 3 units  
 29) reflect across the x-axis  
 translate down 3 units  
 30) shift to left by 5  
 reflect across the x-axis  
 shift down by 2  
 31) shift left 4 units  
 32)  $f^{-1}(x) = \frac{1-x}{x+1}$   
 33)  $g^{-1}(x) = -2x - 8$       34)  $\left(\frac{1}{11}\right)^2 = \frac{1}{121}$       35)  $121^{\frac{1}{2}} = 11$       36)  $15^2 = 225$   
 37)  $7^{-2} = \frac{1}{49}$       38)  $\log_9 \frac{1}{81} = -2$       39)  $\log_{19} x = y$       40)  $\log_{16} y = x$   
 41)  $\log_x 140 = y$       42)  $-3$       43) 2      44)  $\frac{1}{2}$   
 45)  $\frac{1}{3}$       46) 1.968      47) .340      48)  $n = -1$   
 49)  $m = -1$       50)  $x = \frac{\sqrt{30}}{3}, -\frac{\sqrt{30}}{3}$       51)  $x = \frac{6}{7}$       52)  $x = \frac{37}{4}$   
 53)  $x = 81, -81$       54)  $\log_5 (z\sqrt[3]{yx})$       55)  $\log_2 \sqrt{zyx}$       56)  $\log_7 \frac{x^2}{y^4}$   
 57)  $\log_5 (y^{24}x^6)$       58)  $2\log_6 u + 12\log_6 v$       59)  $4\log_2 x + 5\log_2 y$

- 60)  $\log_8 a + \log_8 b + 4\log_8 c$       61)  $6\log_6 a - 30\log_6 b$       62)  $-0.3998$   
 63)  $-0.2769$       64)  $\$8,974.24$       65)  $\$17,493.65$       66)  $3.3$  years  
 67) a)  $n(t)=18000e^{0.08t}$       68) a)  $3125$       69)  $130s$       70)  $-\frac{5\pi}{6}$   
     b)  $34,137$       b)  $317,480$

- 71)  $-\frac{31\pi}{18}$       72)  $\frac{5\pi}{9}$       73)  $\frac{53\pi}{36}$       74)  $745^\circ$   
 75)  $435^\circ$       76)  $200^\circ$       77)  $120^\circ$   
 78)  $m\angle B = 23^\circ, b = 3.4, c = 8.7$       79)  $m\angle B = 59.2^\circ, m\angle A = 30.8^\circ, c = 15.6$   
 80)  $19.6$  ft.      81)  $38.7^\circ$

- 82)  $\frac{24}{7}$       83)  $\frac{4\sqrt{15}}{15}$   
 84)  $\frac{15}{8}$       85)  $\frac{12}{13}$       86)  $0$       87)  $\sqrt{2}$   
 88)  $\frac{1}{2}$       89)  $-\frac{\sqrt{3}}{3}$       90)  $\frac{\sqrt{3}}{2}$       91)  $-\frac{1}{2}$   
 92)  $-2$       93)  $\frac{1}{2}$       94)  $-\frac{\sqrt{3}}{3}$       95)  $\frac{\sqrt{3}}{2}$



102)  $-\frac{\pi}{6}$

- 103)  $\frac{\sqrt{41}}{4}$       104)  $\frac{12}{13}$       105)  $33^\circ$       106)  $20.9^\circ$

- 107)  $m\angle C = 7^\circ, a = 22.9, b = 26.9$       108)  $m\angle C = 130.8^\circ, m\angle A = 27.2^\circ, c = 54.6$   
     Or  $m\angle C = 5.2^\circ, m\angle A = 152.8^\circ, c = 6.5$

- 109) Not a triangle      110)  $m\angle B = 32^\circ, a = 26, b = 17$

111)  $m\angle B = 63^\circ, m\angle C = 75^\circ, m\angle A = 42^\circ$

112)  $m\angle B = 56^\circ, m\angle C = 47^\circ, a = 20$

113)  $\frac{\sin x + \sec x}{\sec x}$  Decompose into sine and cosine

114)  $\tan x + \sec x$  Decompose into sine and cosine

$\frac{\sin x + \frac{1}{\cos x}}{\frac{1}{\cos x}}$  Simplify

$\frac{\sin x}{\cos x} + \frac{1}{\cos x}$  Simplify

$\frac{\sin x + 1}{\cos x}$  ■

$\sin x \cos x + 1$  ■

115) Use sum and difference formulas

116) use pythagorean identities

117) Use pythagorean identities and reciprocal identities

118)  $\frac{\sqrt{2} - \sqrt{6}}{4}$

119)  $\frac{\sqrt{6} - \sqrt{2}}{4}$

120) a)  $\frac{24}{25}$

121) a)  $\frac{\sqrt{10}}{10}$

b)  $-\frac{7}{25}$

b)  $-\frac{3\sqrt{10}}{10}$

c)  $-\frac{24}{7}$

c)  $-\frac{1}{3}$

122)  $\frac{\sqrt{2} + \sqrt{2}}{2}$

123)  $180^\circ n$

124)  $45^\circ + 180^\circ n$

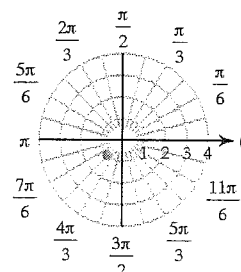
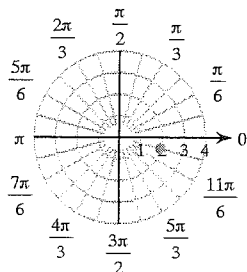
125)  $109.5^\circ + 360^\circ n, 250.5^\circ + 360^\circ n$

126)  $90^\circ + 360^\circ n$

127)  $60^\circ + 180^\circ n, 120^\circ + 180^\circ n$

128)

129)



130)  $\left(-\frac{3\sqrt{2}}{2}, -\frac{3\sqrt{2}}{2}\right)$

131)  $(2\sqrt{3}, -2)$

132)  $\left(3, \frac{7\pi}{6}\right)$

133)  $\left(1, \frac{2\pi}{3}\right)$

134)  $\cot \theta = 5$

135)  $r = 3$

136)  $(x+3)^2 + (y+1)^2 = 10$

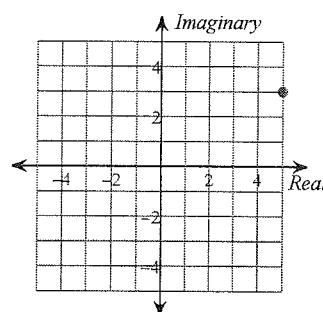
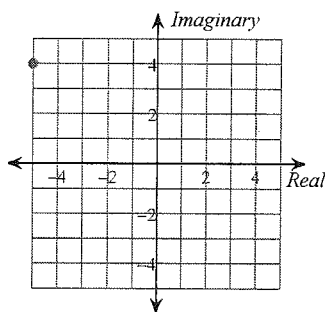
137)  $y = 4x$

138)  $6\sqrt{2}$

139) 6

140)

141)



142)  $4(\cos 270^\circ + i \sin 270^\circ)$

143)  $6(\cos 330^\circ + i \sin 330^\circ)$

144)  $-64$

145)  $-198 + 10i$

146)  $\langle 8, 0 \rangle$

147)  $\langle -98, -336 \rangle$

148)  $\langle -13, -14 \rangle$

149)  $\langle 1, -7 \rangle$

150)  $2\sqrt{865} \approx 58.822$

151)  $2\sqrt{157} \approx 25.06$

152) 11

$324.69^\circ$

$61.39^\circ$

$264.78^\circ$

153) 20

154) 24

155)  $126.87^\circ$

156)  $54.46^\circ$