Formation of P.D.E by eliminating arbitary function.

01. $z = ax^2 + by^2$

02. $(x-a)^2 + (y-b)^2 = z^2 \cot^2\alpha$ where α is a parameter

03. Find the differential equation of all spheres whose centres lie on the z-axis.

04. $ax + by + cz = 1$

05. $z = (x+y)\phi(x^2-y^2)$

06. $z = x^n f\left(\frac{y}{x}\right)$

07. $xyz = f(x+y+z)$

08. $z = f(x)\,g(y)$

09. $z = f(x+y)\cdot g(x-y)$

10. $z = xf(ax+by) + g(ax+by)$

11. $F(xy+z^2,\ x+y+z) = 0$

12. $xyz = f(x+y+z)$

13. $F(x^2+y^2+z^2,\ z^2-2xy) = 0$

14. $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$

15. $z = ax + by + a^2 + b^2$

16. $z = (x^2+a^2)(y^2+b^2)$

17. $z = axy + b$

18. $z = axe^y + \frac{1}{2}a^2e^{2y} + b$

19. $z = (x-a)^2 + (y-b)^2 + 1$

20. $z = a(x+y) + b(x-y) + abt + c$

21. $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$

22. $z = ae^{-b^2t}.\cos bx$

23. $z = ae^{bx} \sin by$

24. $z = xy + y\sqrt{x^2+a^2} + b$

25. All planes which are at a constant distance b from the origin.

26. All planes having equal x and y intercepts.
Hint: Equation $\frac{x}{a} + \frac{y}{a} + \frac{z}{b} = 1$

27. All spheres of given radius c having their centres in the xy-plane.

28. All cones with their vertices at the origin.

29. $z = f(x^2 - y^2)$

30. $x + y + z = f(x^2 + y^2 + z^2)$

31. $z = yf\left(\frac{y}{x}\right)$

32. $z = f(\sin x + \cos y)$

33. $z = e^{ax+by} \cdot f(ax - by)$

34. $z = y^2 + 2f\left(\frac{1}{x} + \ln y\right)$

35. $z = x + y + f(xy)$

36. $z = f\left(\frac{xy}{z}\right)$

37. $z = f(x + at) + g(x - at)$

38. $z = f(x) + e^y g(x)$

39. $z = f(x + iy) + g(x - iy)$

40. $z = yf(x) + xg(y)$

41. $z = xf\left(\frac{y}{x}\right) + yg(x)$

42. $z = f(xy) + g(x + y)$

43. $z = [f(x-at) + g(x+at)]/x$

44. $F(x^2+y^2,\ z-xy) = 0$

45. $F(x+y+z,\ x^2+y^2-z^2) = 0$

46. $F(x^2+y^2,\ x^2-z^2) = 0$

47. $F(ax+by+cz,\ x^2+y^2+z^2) = 0$

48. $z = x^2\phi(x-y)$

49. $xp + yq = 3z$

50. $yzp - xzq = xy$

51. $p - q = \ln(x+y)$

52. $z(z^2+xy)(px-qy) = x^4$

53. $xzp + yzq = xy$

54. $(z-y)p + (x-z)q = y-x$

55. $(y+zx)p - (x+yz)q = x^2-y^2$

56. $(y^2+z^2)p - xyq + zx = 0$

57. $px(x+y) = qy(x+y) - (2x+2y+z)(x-y)$

58. $(x^2-y^2-yz)p+(x^2-y^2-zx)q=z(x-y)$

59. $y^2zp+x^2zq=xy^2$

60. $p\tan x+q\tan y=\tan z$

61. $xp+yq=z$

62. $2p+3q=1$

63. $x^2p+y^2q=z^2$

64. $pyz+qzx=xy$

65. $x^2p+y^2q=(x+y)z$

66. $p+3q=5z+\tan(y-3x)$

67. $z(p-q)=z^2+(x+y)^2$

68. $z(xp-yq)=y^2-x^2$

69. $(x^3+3xy^2)p+(y^3+3x^2y)q=2(x^2+y^2)z$

70. $x^2(y^3-z^3)p+y^2(z^3-x^3)q=z^2(x^3-y^3)$

71. $(2x^2+y^2+z^2-2yz-zx-xy)p+(x^2+2y^2+z-yz-2zx-xy)q$
$=(x^2+y^2+2z^2-yz-2xy)$

72. $(mz-ny)p+(nx-lz)q=z^2-xy$

73. $(x^2-yz)p+(y^2-zx)q = z^2-xy$

74. $(x^2-y^2-z^2)p+2xyq = 2xz$

75. $(x+2z)p+(4zx-y)q = 2x^2+y$

76. $x(y-z)p+y(z-x)q = z(x-y)$

77. $(y-z)p+(x-y)q = (z-x)$

78. $(y+z)p+(z+x)q = x+y$

79. $x^2(y-z)p+y^2(z-x)q = z^2(x-y)$

80. $(z^2-2yz-y^2)p+(xy+zx)q = xy-zx$

81. $px(z-2y^2) = (z-qy)(z-y^2-2x^3)$

82. $x(y^2-z^2)p+y(z^2-x^2)q = z(x^2-y^2)$

83. $p^3-q^3 = 0$

84. $p^2+q^2 = npq$

85. $(x+y)(p+q)^2+(x-y)(p-q)^2 = 1$

86. $(x-y)(px-qy) = (p-q)^2$

87. $zpq = p+q$

88. $p^2z^2 + q^2 = p^2q$

89. $p^2x^2 = z(z - qy)$

90. $yp + xq + pq = 0$

91. $p^2q^2 + x^2y^2 = x^2q^2(x^2 + y^2)$

92. $zpy^2 = x(y^2 + z^2q^2)$

93. $z = px + qy + \ln pq$

94. $(p-q)(z - px - qy) = 1$

95. $pq = k$

96. $p^2 + q^2 = m^2$

97. $\sqrt{p} + \sqrt{q} = 1$

98. $p^2 - q^2 = 4$

99. $p + q = pq$

100. $p = e^q$

101. $2p^2 + 6p + 2q + 4 = 0$

102. $x^2p^2 + y^2q^2 = z^2$

103. $(x^2+y^2)(p^2+q^2) = 1$

104. $pq = x^m y^n z^l$

105. $p^2z^2 + q^2 = 1$

106. $p(1+q) = qz$

107. $q^2 = z^2p^2(1-p^2)$

108. $p^3+q^3 = 27z$

109. $z^2(p^2+q^2+1) = \alpha^2$

110. $z^2 = 1 + p^2 + q^2$

111. $p(1+q^2) = q(z-\alpha)$

112. $q(p^2z+q^2) = $ ~~$q(z-$~~ y

113. $z^2(p^2x^2+q^2) = 1$

114. $q^2y^2 = z(z-px)$

115. $p^2 \pm q^2 = x \pm y$

116. $\sqrt{p} + \sqrt{q} = x+y$

117. $p+q = \sin x + \sin y$

118. $p^2y(1+x^2) = qx^2$

119. $pe^y = qe^x$

120. $p - q = x^2 + y^2$

121. $y^2q^2 - xp + 1 = 0$

122. $z^2(p^2+q^2) = x^2+y^2$

123. $z(xp - yq) = y^2 - x^2$

124. $z(p^2 - q^2) = x - y$

125. $2q(z - px - qy) = 1 + q^2$

126. $pqz = p^2(xq + p^2) + q^2(yp + q^2)$

127. $z = px + qy \pm pq$

128. $(px + qy - z)^2 = a(1 + p^2 + q^2)$

129. $(p+q)(z - xp - yq) = 1$

130. $4xyz = pq + 2px^2y + 2qxy^2$

131. $z^2 = pqxy$

132. $2(z + xp + yq) = yp^2$

133. $16p^2z^2 + 9q^2z^2 + 4z^2 - 4 = 0$

134. $p(1+q^2) + (b-z)q = 0$

135. $2xz - px^2 - 2qxy + pq = 0$

136. $q \pm px - p^2 = 0$

137. $px + qy \pm pq = 0$

138. $qz - p^2y \pm pq = 0$

139. $\frac{p^2+qy}{2} = -(z+y^2)$

140. $yz - p(xy+q) - qy = 0$

141. $2(xy - px - qy) + p^2 + q^2 = 0$

142. $z - q^2y - p^2x = 0$

143. $(D_x^2 - 3D_x^2 D_y + 2D_y^2 D_x)z = 0$

144. $25r - 40s + 16t = 0$ or $(25D_x^2 - 40D_{xy} + 16D_y^2)z = 0$

145. $(D_x^4 + D_x^3 D_y - 3D_x^2 D_y^2 - 5D_x D_y^3 - 2D_y^4)z = 0$

146. $r + b^2t = 0$ or $(D_x^2 + b^2 D_y^2)z = 0$

147. $(D_x + 2D_y - 3)(D_x + D_y - 1)z = 0$

148. $(D_x + 2D_y)(D_x + 3D_y + 1)(D_x + 2D_y + 2)^2 z = 0$

149. $(D_x^2 + D_x D_y - D_y^2 + D_x - D_y) z = 0$

150. $(D_x^2 - D_x D_y - 6D_y^2) z = 0$

151. $(D_x^3 - D_x^2 D_y - 8D_x D_y^2 + 12 D_y^3) z = 0$

152. $(D_x^4 - D_x^3 D_y + 2D_x^2 D_y^2 - 5D_x D_y^3 + 3D_y^4) z = 0$

153. $(2D_x^2 + 5D_x D_y + 2D_y^2) z = 0$

154. $(2D_x^2 + 6D_x D_y + 9D_y^2) = 0$

155. $(D_x^4 - D_y^4) z = 0$

156. $(D_x^2 - a^2 D_y^2) z = 0$

157. $(9D_x^2 + 24 D_x D_y + 16 D_y^2) z = 0$

158. $(2D_x + D_y + 1)(D_x^2 + 3D_x D_y - 3D_y) z = 0$

159. $(2D_x + D_y + 5)(D_x - 2D_y + 1)^2 z = 0$

160. $(D_x^2 - D_y^2 + 3D_x - 3D_y) z = 0$

161. $(2D_x + 3D_y - 1)^2 (D_x - 3D_y + 3)^3 z = 0$

162. $(D_x^4 + D_y^4 - 2D_x^2 D_y^2) z = 0$ (Biharmonic equation)

163. $(D_x^3 - 3D_x^2 D_y + 2D_x D_y^2)z = 0$

164. $(D_x^3 - 6D_x^2 D_y + 11 D_x D_y^2 - 6D_y^3)z = 0$