MATHS

BOOKS - RD SHARMA MATHS (HINGLISH)

PARABOLA

Solved Examples And Exercises

1. An equilateral triangle is inscribed in the parabola $y^2 = 4ax$ whose vertex is at of the

parabola. Find the length of its side.

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2. If the points $(0, 4) and (0, 2)$ are respectively the vertex and focus of a parabola, then find the equation of the parabola.

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3. PQ is a double ordinate of a parabola $y^2 = 4ax$. Find the locus of its points of

trisection.

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4. If y_1, y_2, y_3 be the ordinates of a vertices of the triangle inscribed in a parabola $y^2 = 4ax$, then show that the area of the triangle is $\frac{1}{8a}|(y_1 - y_2)(y_2 - y_3)(y_3 - y_1)|$.

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5. If the line $lx + my + n = 0$ touches the parabola $y^2 = 4ax$, prove that $\ln = am^2$

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6. Find the equation of the parabola whose latus-rectum is $4units$, axis is the line $3x + 4y - 4 = 0$ and the tangent at the vertex is the line $4x - 3 + 7 = 0$.

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7. If the line $y = mx + 1$ is tangent to the parabola $y^2 = 4x$, then find the value of m.

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8. Find the vertex, focus, directrix, axis and latus-rectum of the parabola $y^2 = 4x + 4y$.

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9. Find the vertex, axis, focus, directrix, latus-rectum of the following parabolas. Also, draw their rough sketches. $y^2 - 8y - x + 19 = 0$

$4y^2 + 12x - 20y + 67 = 0$ $y = x^2 - 2x + 3$

$x^2 - 2y - 3x + 5 = 0$

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10. Find the equation of the parabola whose focus is $(1, -1)$ and whose vertex is $(2, 1)$. Also find the axis and latusrectum.

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11. Find the equation of the line with points (2,-3) and (0,5)

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12. Find the equation of the parabola whose focus is $(-3, 2)$ and the directrix is $x + y = 4$.

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13. Find the equation of the lines joining the vertex of the parabola $y^2 = 6x$ to the point on it which have abscissa 24.

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14. For the following parabolas find the coordinates of the foci, the equations of the directrices and the lengths of the latus rectum: $y^2 = 8x$

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15. Find the equation of the parabola whose focus is the point $(0, 0)$ and the directrix is the straight line $3x - 4y + 3 = 0$.

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16. Find the area of the triangle formed by the lines joining the vertex of he parabola $x^2 = 12y$ to the ends of its latus-rectum.

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17. Find the coordinates of points on the parabola $y^2 = 8x$ whose focal distance is 4.

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18. Find the length of the line segment joining the vertex of the parabola $y^2 = 4ax$ and a point on the parabola where the line segment make and angle θ to the $x - a\xi s$.

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19. Find the equation of the parabola whose focus is$(1, 1)$ and tangent at the vertex is $x + y = 1$.

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20. Find the equation of the parabola with vertex is at $(2, 1)$ and the directrix is $x = y - 1$.

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21. The focal distance of a point on the parabola $y^2 = 12x$ is 4. Find the abscissa of this point.

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22. Find the equation of the parabola whose focus is at (-2) and the directrix the line $x - 2y + 3 = 0$

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23. Find the vertex, focus and directrix of the parabola $4y^2 + 12x - 12y + 39 = 0.$

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24. Find the angle made by a double ordinate of length at the vertex of the parabola $y^2 = 4ax.$

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25. P is parabola, whose vertex and focus are on the positive x axis at distances a and a' from the origin respectively, then $(a' > a)$. Length of latus ractum of P will be

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26. Find the locus of the middle points of the chords of the parabola $y^2 = 4ax$ which subtend a right angle at the vertex of the parabola.

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27. If a parabolic reflector is 20 cm in diameter and 5 cm deep, find its focus.

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28. over the towers of a bridge a cable is hung in the form of a parabola, have their tops 30 meters above the road way are 200 meters apart. If the cable is 5 meters above the road way at the centre of the bridge, then the

length of the vertical supporting cable 30 meters from the centre is

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29. An arch is in the form of a parabola with its axis vertical. The arc is 10m high and 5m wide at the base. How wide is it 2m from the vertex of the parabola?

A. $\sqrt{2}$

B. $\sqrt{3}$

C. $\sqrt{5}$

D. 4

Answer: C

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30. A beam is supported at its ends by supports which are 12 metres apart. Since the load is connected at its centre, there is a deflection of e centre and the deflected beam

is in the shape of a parabola. How far from the centre is the deflection 1 cm?

A. $2\sqrt{2}$

B. $3\sqrt{2}$

C. $2\sqrt{3}$

D. $2\sqrt{6}$

Answer: D

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31. Find the equation of the parabola whose: focus is (3,0) and the directrix is $3x + 4y = 1$.

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32. The equation of the parabola whose focus is $(1, 1)$ and the directrix is $x + y + 1 = 0$

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33. Find the equation of the parabola whose: focus is (0,0) and the directrix $2x - y - 1 = 0$

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34. Find the length of the latus rectum of the parabola whose focus is at (2, 3) and directrix is the line $x - 4y + 3 = 0$.

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35. Find the length of the latus rectum of the parabola whose focus is at (2, 3) and directrix is the line $x - 4y + 3 = 0$.

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36. Find the equation of the parabola, if the focus is at $(-6, -6)$ and the vertex is at $(-2, 2)$

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37. Find the equation of the parabola, if: the focus is at (0,-3) and the vertex is at (0,0)

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38. Find the equation of the parabola, if: the focus is at $(a, 0)$ and the vertex is at $(a', 0)$

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39. Find the equation of the parabola whose focus is $(0, 0)$ and the vertex is the point of intersection of the lines $x + y = 1$ and $x - y = 3$.

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40. Find the vertex , focus, axis, directrix and latus rectum of the following parabola: $y^2 = 8x$

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41. Find the vertex, focus, directrix, axis and latus-rectum of the parabola $y^2 = 4x + 4y$.

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42. Find the vertex , focus, axis, directrix and latus rectum of the following parabola: $4x^2 + y = 0$

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43. Find the vertex , focus, axis, directrix and latus rectum of the following parabola:

$y^2 + 4x + 4y - 3 = 0$

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44. Find the vertex , focus, axis, directrix and latus rectum of the following parabola:

$y^2 = 5x - 4y - 9$

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45. Find the vertex , focus, axis, directrix and latus rectum of the following parabola:

$y^2 - 4y - 3x + 1 = 0$

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46. Find the vertex , focus, axis, directrix and latus rectum of the following parabola:

$y^2 = 8x + 8y$

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47. Find the vertex , focus, axis, directrix and latus rectum of the following parabola: $x^2 + y = 6x - 14$

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48. For the parabola $y^2 = 4px$ find the extremities of a double ordinate of length $8p$. Prove that the lines from the vertex to its extremities are at right angles.

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49. Find the coordinates of the point of intersection of the axis and the directrix of the parabola whose focus is (3,3) and directrix is $3x - 4y = 2$. Find also the length of the latus rectum.

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50. At what point of the parabola $x^2 = 9y$ is the abscissa three times that of ordinate?

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51. The equation of the parabola with vertex at the origin passing through $(2, 3)$ and the axis along x-axis is

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52. Find the equation of a parabola with vertex at the origin and the directrix, $y = 2$.

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53. The cable of a uniformly loaded suspension bridge hangs in the form of a parabola. The roadway which is horizontal and 100 m long is supported by vertical wires attached to the cable, the longest wire being 30 m and the shortest being 6 m. Find t

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54. Write the axis of symmetry of the parabola $y^2 = x$.

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55. Write the distance between the vertex and focus of the parabola $y^2 + 6y + 2x + 5 = 0$.

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56. The directrix of the parabola $x^2 - 4x - 8y + 12 = 0$ is

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57. Write the equation of the parabola with focus (0,0) and directrix $x + y - 4 = 0$.

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58. Write the length of the chord of the parabola $y^2 = 4ax$ which passes through the vertex and in inclined to the axis at $\frac{\pi}{4}$.

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59. If $b\,and\,c$ are lengths of the segments of any focal chord of the parabola $y^2 = 4ax$, then write the length of its latus rectum.

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60. PSQ is a focal chord of the parabola $y^2 = 8x\dot{I}f\ SP = 6,$ then write SQ.

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61. vertex and focus of a parabola are (-1,1) and (2,3) respectively. find the equation of the directrix.

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62. If the parabola $y^2 = 4ax$ passes through the point (3,2) then find the length of its latus rectum.

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63. If the vertex of a parabola is the point $(-3, 0)$ and the directrix is the line $x + 5 = 0$, then find its equation.

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64. The coordinates of the focus of the parabola $y^2 - x - 2y + 2 = 0$ are a. (5/4,1) b. (1/4,0) c. (1,1) d. none of these

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65. The vertex of the parabola $(y+a)^2 = 8a(x-a)$ is a.$(-a, -a)$ b. $(a, -a)$ c. $(-a, a)$ d. none of these

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66. If the focus of a parabola is (-2,1) and the directrix has the equation $x + y = 3$ then its vertex is a. (0,3) b. (-1,1/2) c. (-1,2) d. (2,-1)

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67. The equation of the parabola whose vertex is $(a, 0)$ and the directrix has the equation $x + y = 3a$ is

a. $x^2 + y^2 + 2xy + 6ax + 10ay + 7a^2 = 0$

b. $x^2 - 2xy + y^2 - 6ax + 10ay + 7a^2 = 0$

c. $x^2 - 2xy + y^2 + 6ax + 10ay + 7a^2 = 0$

d.None of these

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68. The parametric equations of a parabola are $x = t^2 + 1, y = 2t + 1.$ The Cartesian equation of its directrix is a.$x = 0$ b. $x + 1 = 0$ c. $y = 0$ d. none of these

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69. vertex and focus of a parabola are (-1,1) and (2,3) respectively. find the equation of the directrix.

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70. The equation of the directrix of the parabola whose vertex and focus are (1,4) and (2,6) respectively is a.$x + 2y = 4$ b. $x - y = 3$ c. $2x + y = 5$ d. $x + 3y = 8$

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71. If V and S are respectively the vertex and focus of the parabola $y^2 + 6y + 2x + 5 = 0$, then $SV =$ a. 2 b. 1/2 c. 1 d. none of these

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72. The directrix of the parabola $x^2 - 4x - 8y + 12 = 0$ is

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73. The equation of the parabola with focus (0,0) and directrix $x + y = 4$ is a. $x^2 + y^2 - 2xy + 8x + 8y - 16 = 0$ b. $x^2 + y^2 + 8x + 8y - 16 = 0$ 2-2x y+8x+8y=0

d. x^2-y^2+8x+8y-16=0`

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74. The line $2x - y + 4 = 0$ cuts the parabola $y^2 = 8x$ in P and Q. The mid-point of PQ is

(a) $(1, 2)$ (b) $(1, -2)$ (c) $(-1, 2)$ (d) $(-1, -2)$

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75. In the parabola $y^2 = 4ax$, the length of the chord pasing through the vertex and

inclined to the axis at $\pi/4$ is a.$4\sqrt{2}a$ b. $2\sqrt{2}a$ c. $\sqrt{2}a$ d. none of these

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76. The length of the latus rectum of the parabola $y^2 + 8x - 2y + 17 = 0$ is a.2 b. 4 c. 8 d. 16

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77. The vertex of the parabola $(y-2)^2 = 16(x-1)$ is a.$(1, 2)$ b.$(-1, 2)$ c. $(1, -2)$ d. $(2, 1)$

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78. The length of latus rectum of the parabola $4y^2 + 2x - 20y + 17 = 0$ is (a) 3 (b) 6 (c) $\frac{1}{2}$ (d) 9

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79. The focus of the parabola $y = 2x^2 + x$ is a. $(0, 0)$ b. $(1/2, 1/4)$ c. $(-1/4, 0)$ d. $(-1/4, 1/8)$

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80. Which of the following points lie on the parabola $x^2 = 4ay$? a. $x = at^2, y = 2at$ b. $x = 2at,\ y = at^2$ c. $x = 2at^2, y = at$ d. $x = 2at,\ y = at^2$

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81. The equation of the parabola whose focus is (1,-1) and the directrix is $x + y + 7 = 0$ is

(a).$x^2 + y^2 - 2xy - 18x - 10y = 0$ (b). $x^2 + y^2 - 18x - 10y - 45 = 0$

(c). $x^2 - 18x - 10y - 45 = 0$ (d). $x^2 + y^2 - 2xy - 18x - 10y - 45 = 0$

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Others

1. The locus of the points of trisection of the double ordinates of a parabola is a a. pair of lines b. circle c. parabola d. straight line

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2. The equation $16x^2 + y^2 + 8xy - 74x - 78y + 212 = 0$ represents a. a circle b. a parabola c. an ellipse d. a hyperbola

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