

Conic Sections and Parametric Equations: math test solutions, Grade 12 – download the PDF

Test solutions with the detailed point scale. Add up your points and spot what to review.

Suggested time: 45 minutes. Out of 20 points. Calculator allowed only when the problem says so.

1 Circle

/ 4 pts

- $(x^2 + 6x) + (y^2 - 10y) = -18$, so $(x + 3)^2 + (y - 5)^2 = -18 + 9 + 25 = 16$.
Center $(-3, 5)$, radius 4. (2 pts)
- $(0)^2 + (9 - 5)^2 = 16$: yes, the point is on the circle. (1 pt)
- With $y = 5$: $(x + 3)^2 = 16$, so $x = 1$ or $x = -7$. Points $(1, 5)$ and $(-7, 5)$. (1 pt)

2 Parabola

/ 4 pts

- $4p = 16$, $p = 4$. Vertex $(0, 0)$, focus $(4, 0)$, directrix $x = -4$. (2 pts)
- $y^2 = 144$, so $y = \pm 12$: points $(9, \pm 12)$ (1 pt). Distance to the focus:
 $\sqrt{(9 - 4)^2 + 12^2} = \sqrt{169} = 13$; distance to the directrix: $9 + 4 = 13$. (1 pt)

3 Ellipse

/ 4 pts

- a. Divide by 400: $\frac{x^2}{25} + \frac{y^2}{16} = 1$. $a = 5$, $b = 4$, $c = \sqrt{25 - 16} = 3$, vertices $(\pm 5, 0)$. (2 pts)
- b. Foci $(\pm 3, 0)$; $e = \frac{3}{5}$. (1 pt)
- c. $PF_2 = \frac{16}{5} = 3.2$ (same x as the focus $(3, 0)$);
 $PF_1 = \sqrt{6^2 + 3.2^2} = \sqrt{46.24} = 6.8$. Sum = 10 = $2a$. (1 pt)

4 Hyperbola

/ 4 pts

- a. $a = 6$, $b = 8$, $c = \sqrt{36 + 64} = 10$, $e = \frac{10}{6} = \frac{5}{3}$. (2 pts)
- b. The branches open up and down: vertices $(0, \pm 6)$, foci $(0, \pm 10)$ (1 pt), asymptotes
 $y = \pm \frac{6}{8}x = \pm \frac{3}{4}x$. (1 pt)

5 Parametric equations

/ 4 pts

- a. $\cos t = \frac{x-1}{4}$, $\sin t = \frac{y+2}{3}$, so $\frac{(x-1)^2}{16} + \frac{(y+2)^2}{9} = 1$: an ellipse with center $(1, -2)$ (1 pt). At $t = \frac{\pi}{2}$: $(1, 1)$. (1 pt)
- b. $t = \frac{x+1}{3}$, so $y = \frac{(x+1)^2}{9}$, a parabola with vertex $(-1, 0)$. (2 pts)



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