Pure Math 30

EXPLAINED!

Diploma Style Practice Exam

CONICS

--QUESTIONS--

Conics Diploma Style Practice Exam

Formulas

These are the formulas for conics you will be given on your diploma

$$(x-h)^2+(y-k)^2=r^2$$

$$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$$

$$Ax^2+Cy^2+Dx+Ey+F=0 \quad , \quad A,\ C,\ D,\ E,\ F \ \in I$$

$$y-k=a(x-h)^2$$

$$x-h=a(y-k)^2$$

$$\frac{(x-h)^2}{a^2}-\frac{(y-k)^2}{b^2}=\pm 1$$

Use this sheet to record your answers

1.	**11.**	**19.**
NR 1)	**NR 2)**	**20.**
2.	**NR 3)**	**21.**
3.	**12.**	**22.**
4.	**13.**	**23.**
5.	**14.**	**24.**
6.	**15.**	**25.**
7.	**16.**	**26.**
8.	**17.**	**27.**
9.	**NR 4)**	**28.**
10.	**18.**	**29.**

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Conics Diploma Style Practice Exam

1. The equation of a conic is given by $\frac{(x-3)^2}{4}-\frac{(y+1)^2}{16}=-1$. The range of this graph is

A. $y \le -5,\ y \ge 3$
B. $y \le -5\ ,\ y \ge 4$
C. $y \le -4\ ,\ y \ge 4$
D. $-4 \le y \le 4$

Use the following information to answer the next question.

The graph below represents the path of a stone thrown horizontally off a 70 m tall building. The stone lands 59 m away from the building.

Numerical Response

1. The equation of the parabolic trajectory is of the form $x^2+m(y-70)=0$.
The value of *m*, to the nearest tenth, is _____.

2. A shape that is impossible to produce when a plane intersects a double napped cone is

A. two parallel lines
B. a single line
C. two intersecting lines
D. a point

3. The range of the conic defined by $16x^2 + 25y^2 - 400 = 0$ is

A. $|y| < 4$
B. $|y| \leq 4$
C. $|y| < 5$
D. $|y| \leq 5$

Use the following information to answer the next question.

A lighthouse shines a light on the ground, forming the shape of an ellipse.
The general form of the ellipse shown below is $Ax^2 + Cy^2 + Dx + Ey + F = 0$.

4. The statement which correctly produces an ellipse is

A. A and C have the same sign
B. A and C have different signs
C. A is zero
D. C is zero

5. The vertex of a parabola defined by the general equation $-2y^2 - x + 20y - 47 = 0$ is

A. (3, 5)
B. (-1, -2)
C. (0, -47)
D. (-22, 10)

6. The equation of a degenerate conic is $3x^2 - Dx + Ey - F = 0$. The shape formed by this equation is

A. a single line
B. two intersecting lines
C. an ellipse
D. a hyperbola

Use the following information to answer the next question.

A conic is graphed using technology, and is shown below. The distance between the *x*-intercepts is $2\sqrt{11}$ units, and the distance between the *y*-intercepts is 10 units.

7. The equation of the graph shown above is

A. $\frac{x^2}{25} + \frac{y^2}{44} = 1$

B. $\frac{x^2}{44} + \frac{y^2}{25} = 1$

C. $\frac{x^2}{25} + \frac{y^2}{11} = 1$

D. $\frac{x^2}{11} + \frac{y^2}{25} = 1$

8. The hyperbola $\frac{3(x-1)^2}{17}-\frac{(y+1)^2}{17}=1$ is changed to general form and is represented by $Ax^2+Cy^2-6x+Ey+F=0$. If $C < 0$, then the value of E is

A. -17
B. -2
C. 2
D. 17

9. The range of the conic defined by $9x^2+4y^2-54x+16y+61=0$ is

A. $-1 \le x \le 5$
B. $-4 \le y \le 0$
C. $0 \le y \le 6$
D. $-5 \le y \le 1$

10. The graph of $x^2+y^2-x+5y-6=0$ has $y-$ intercepts located at

A. (0, -3) and (0, 2)
B. (0, 2) and (0, -3)
C. (0, -6) and (0, 1)
D. (0, -1) and (0, 6)

Use the following information to answer the next question.

The following graph shows $f(x) = x^2$ and its transformation $y = g(x)$

11. The graph of $y = f(x)$ is transformed to the graph of $y = g(x)$ by which of the following transformations?

A. reflecting about the line $y = -x$
B. reflecting about the y – axis, then reflecting about the x - axis
C. reflecting about the x – axis, then reflecting about the y - axis
D. $g(x) = f^{-1}(x)$

_____

Numerical Response

2. A parabola with a vertical axis of symmetry has a vertex located at the point (-3, 5) and passes through the point (-1, -4). If $a < 0$, the value of $|a|$, to the nearest hundredth, is _____.

Use the following information to answer the next question.

An important technological advancement in nanocircuit production is the hyperbolic "spark gap", where electrons can jump from one conducting surface to the other. A nanotechnology researcher is analyzing a particular spark gap in an electron microscope, and the field of view is shown below.

The centre of the spark gap is located at the point (-723, -502), and the researcher knows that a point on the conductive surface is (2001, 104)

Numerical Response

3. The spark gap is modeled using the hyperbola formula $\frac{(x-h)^2}{a^2}-\frac{(y-k)^2}{b^2}=1$.

If the researcher determines the value of *a* is 1243 nm, then the total distance across the gap, to the nearest whole number, is _____ nm.

Use the following information to answer the next question.

The circle $x^2 + y^2 = 16$ is transformed to the ellipse shown below. The values of the x – intercepts and y – intercepts for each conic are indicated.

12. The transformation that has been applied to the circle is

A. a horizontal stretch by a factor of $\frac{2}{5}$ and a vertical stretch by a factor of $\frac{2}{3}$

B. a horizontal stretch by a factor of $\frac{5}{2}$ and a vertical stretch by a factor of $\frac{3}{2}$

C. a horizontal stretch by a factor of $\frac{3}{2}$ and a vertical stretch by a factor of $\frac{5}{2}$

D. a horizontal stretch by a factor of $\frac{2}{3}$ and a vertical stretch by a factor of $\frac{2}{5}$

Use the following information to answer the next two questions.

The graph of a hyperbola is shown below.

13. The equation of the hyperbola is

A. $\frac{(x-3)^2}{9}-\frac{(y+2)^2}{4}=-1$

B. $\frac{(x-3)^2}{9}-\frac{(y+2)^2}{4}=1$

C. $\frac{(x-3)^2}{4}-\frac{(y+2)^2}{9}=-1$

D. $\frac{(x-3)^2}{4}-\frac{(y+2)^2}{9}=1$

14. If the hyperbola is vertically stretched by a factor of 2 about the line y = -3, the new range of the graph will be

A. $y \le -4$, $y \ge 0$

B. $y \le -5$, $y \ge 3$

C. $y \le -6$, $y \ge 2$

D. $y \in R$

15. A conic can be described by the general form $Ax^2 + Cy^2 + Dx + Ey + F = 0$. If $A < 0$, $C < 0$, and $A \neq C$, then the conic is

A. a circle
B. an ellipse
C. a parabola
D. a hyperbola

16. An ellipse has a centre at the point (-4, 6) and passes through the points (-4, 9) and (2, 6). An equation that describes this ellipse is

A. $\frac{(x-4)^2}{9} + \frac{(y+6)^2}{36} = 1$

B. $\frac{(x-4)^2}{36} + \frac{(y+6)^2}{9} = 1$

C. $\frac{(x+4)^2}{9} + \frac{(y-6)^2}{36} = 1$

D. $\frac{(x+4)^2}{36} + \frac{(y-6)^2}{9} = 1$

Use the following information to answer the next three questions.

A double napped cone is shown below with a generator angle θ.

17. If a plane, initially parallel to the central axis, is rotated clockwise to the position $\frac{\theta}{2}$, the resulting graph could be

A. an ellipse
B. a hyperbola
C. a single line
D. a parabola

Numerical Response

4. If the generator angle θ is 32°, then the angle the plane must pass through to produce a circle is _____°.

18. The plane now passes through the double napped cone parallel to the generator. A possible shape for the graph, if the plane passes through the vertex, is

A. A point
B. A parabola
C. A circle
D. A line

Use the following information to answer the next question.

The graph of $x^2 + y^2 = 1$ is transformed to the ellipse shown below

19. The transformations required to transform Graph I into Graph II, in the correct order, are

A. a translation of 3 units left and 1 unit up, then a vertical stretch by a factor of 4 about the *x*-axis and a horizontal stretch by a factor of 2 about the *y*-axis.

B. a translation of 3 units left and 1 unit up, then a vertical stretch by a factor of 4 about the line $x = -3$ and a horizontal stretch by a factor of 2 about the line $y = -1$

C. a vertical stretch by a factor of 4 about the line $y = -1$ and a horizontal stretch by a factor of 2 about the line $x = -3$, then a translation of 3 units left and 1 unit up.

D. a vertical stretch by a factor of 4 about the *x*-axis and a horizontal stretch by a factor of 2 about the *y*-axis, then a translation of 3 units left and 1 unit up.

20. The general form of a particular ellipse is $2x^2 + y^2 - 2x + 3y - 9 = 0$. If this conic is translated 2 units left and 1 unit down, the new general equation is

A. $2x^2 + y^2 - 1 = 0$
B. $x^2 + 3y^2 - 6x + 5y - 9 = 0$
C. $x^2 + 2y^2 - 6x + 5y + 9 = 0$
D. $2x^2 + y^2 + 6x + 5y - 1 = 0$

Use the following information to answer the next question.

An ellipse, centered at the point (2, -1), is shown in the graph below.

21. If the equation of the ellipse can be represented with the standard form $\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$, then the equation of the ellipse is

A. $\frac{(x-2)^2}{a^2} + \frac{(y+1)^2}{b^2} = \sqrt{10}$
B. $10(x-2)^2 + (y+1)^2 - 5b^2 = 0$
C. $(x-2)^2 + 10(y+1)^2 - 5b^2 = 0$
D. $\frac{(x-2)^2}{10b^2} + \frac{(y+1)^2}{b^2} = 1$

Use the following information to answer the next question.

The vertex angle α of a double-napped cone is 60°, and x represents the angle from the central axis to the cutting plane, with the vertical being 0°.

22. The values of x which will generate an ellipse are

A. $30^0 < x < 90^0$
B. $30^0 \le x \le 90^0$
C. $30^0 \le x \le 60^0$
D. $60^0 < x < 90^0$

23. The vertex of the conic $x^2 + 9y - 2x - 35 = 0$ is located at the point

A. (1, 4)
B. (0, 6)
C. $\left(0, -\frac{1}{9}\right)$
D. $\left(\frac{1}{9}, 0\right)$

24. The circle $x^2 + y^2 = 1$ is translated *h* units left and *k* units down. An equation that can be used to solve for the *x*-intercepts is

A. $(x+h)^2 + k^2 = 1$
B. $x^2 + (y+k)^2 = 1$
C. $y = 0$
D. $x^2 + (y+k)^2 = 0$

25. A parabola is represented by the standard form equation $x - h = a(y-k)^2$.
If $|a| < 1$, the statement which correctly identifies the graph is

A. the parabola is not a function
B. the parabola has a vertex located at $(-h, -k)$
C. the parabola has a vertical axis of symmetry
D. the graph has a vertical stretch by a factor of a

26. A circle is represented by the equation $x^2 + y^2 + 6x - 2y - 6 = 0$. The radius of the circle is

A. 1
B. $\sqrt{6}$
C. 4
D. 6

Use the following information to answer the next question.

The graph of a particular hyperbola is shown below

27. An equation that represents the graph of this hyperbola is

A. $\frac{(x-1)^2}{64}-\frac{(y+1)^2}{144}=1$

B. $\frac{(x-1)^2}{144}-\frac{(y+1)^2}{64}=-1$

C. $\frac{(x-1)^2}{64}-\frac{(y+1)^2}{144}=-1$

D. $\frac{(x-1)^2}{144}-\frac{(y+1)^2}{64}=1$

28. The standard form equation of an ellipse is given by the equation $\frac{(x-2)^2}{16}+\frac{(y+3)^2}{36}=1$. If the ellipse is translated 3 units left and 5 units up, the new equation is

A. $\frac{(x+1)^2}{16}+\frac{(y-2)^2}{36}=1$

B. $\frac{(x-1)^2}{16}+\frac{(y+2)^2}{36}=1$

C. $\frac{(x-5)^2}{16}+\frac{(y+8)^2}{36}=1$

D. $\frac{(x+5)^2}{16}+\frac{(y-8)^2}{36}=1$

29. The standard form equation of a particular ellipse is $\frac{(x-1)^2}{16}+\frac{(y-1)^2}{25}=1$. The general form of this ellipse is

A. $16x^2+25y^2-50x-32y-359=0$

B. $25x^2+16y^2-50x-32y-400=0$

C. $25x^2+16y^2-50x-32y-359=0$

D. $16x^2+16y^2-50x-32y-400=0$

Use the following information to answer the next question.

The Grand Tower in Jacksonville has a support arch that forms the base, and may be modeled using the equations of conics.

The dimensions of the base are represented in the diagram below.

Written Response – 10%

1.

- If the arch is modeled as an ellipse with the standard form $\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$, determine the equation of the arch.

- If the arch is modeled as an parabola with the standard form $y-k=a(x-h)^2$, determine the equation of the arch.

- Determine the height of the arch at a point 30 m away from the centre using the equations found above. If the actual height at this point is 30.2 m, determine which model makes the closest approximation.

Use the following information to answer the next question.

A dartboard is mounted on a circular backing to protect the wall from stray darts.

The dartboard has a diameter of 50.3 cm, and the backing has a diameter of 80.7 cm.

Written Response – 10%

2.

- Determine the standard form equation of the dartboard. Assume the centre of the dartboard is the origin.

- Determine the standard form equation of the backing. Assume the centre of the backing is the origin.

- Describe the transformation required to turn the small circle (dartboard) into the larger circle (backing).

Written Response – 10%

3.

- Given the parabola below, find the equation if the vertex is at (4, -2)

- Verify the intercepts algebraically

- State the domain & range