1. C
2. A
3. C
4. B
5. B

6. B
7. C
8. B
9. A
10. E

11. A
12. B
13. B
14. A
15. B

16. C
17. D
18. B
19. D
20. B

21. C
22. B
23. D
24. E
25. D

26. D
27. A
28. A
29. C
30. B

1. [C] Since $b=-\frac{1}{d}$, $-bd=-\left(-\frac{1}{d}\right)(d)=1$.

2. [A] From the standard form.

3. [C] If the line is not a function, then it is vertical. A vertical line containing (m,n) has equation $x=m$; it contains every point that has abscissa *m*.

4. [B] There are some different options for the fourth vertex. Pick a vertex (A) and travel from A to another point in the same fashion that you travel from vertex B to vertex C. (9,10) and (5,6) work when traveling from (7,8). $(-3,4)$ and (9,10) work when traveling from (3, 7). $(-3,4)$ and (5,6) work when traveling from (1, 5). Since $mn>0$, you have to pick (5, 6) or (9, 10).

5. [B] By definitions.

6. [B] $V=\frac{4\pi r^3}{3} \rightarrow 5\pi k=\frac{4\pi r^3}{3} \rightarrow r^3=\frac{15k}{4}$
   $\rightarrow r=\sqrt[3]{\frac{15k}{4}}$

7. [C] I by definition, and III is the method for evaluating I.

8. [B] The surface area is $6E^2$, so $E=2\sqrt{2}$. To get to another vertex, travel along an edge (*E*), face diagonal ($E\sqrt{2}$), or major diagonal through the cube ($E\sqrt{3}$).

9. [A] Average the *x*-coordinates, and average the *y*-coordinates.

10. [E] The line should have slope $\frac{2}{3}$. But don't pick choice C, because that **is** the line containing the points, and cannot be parallel to itself.

11. [A] The other diagonal must be a perpendicular bisector of the first. So it passes through $(5,4)$ and has slope $-\frac{3}{4}$.

12. [B] $\frac{y^2}{12}-\frac{x^2}{13}=1$ has a vertical transverse axis. The foci are $\left(0,\pm\sqrt{13+12}\right) \rightarrow (0,\pm 5)$.

13. [B] From $(0-h)^2+(8-k)^2=r^2$ and $(-8-h)^2+(4-k)^2=r^2$, set the left sides equal: $h^2+64-16k+k^2=64+16h+h^2+16-8k+k^2$ yields the useful (for this question) equation $2h+k=-2$.

14. [A] Using legs *a* and *b*, $a^2+b^2=32$ and $\frac{ab}{2}=8 \quad \rightarrow \; a=\frac{16}{b}$.

$\left(\frac{16}{b}\right)^2+b^2=32 \rightarrow \frac{256}{b^2}+b^2=32 \quad \rightarrow$

$b^4-32b^2+256=0 \quad \rightarrow (b^2-16)=0$, which solves to $b=\pm 4$, but since the leg must be positive, *b* = 4, and so does *a*. The only viable value of $(m-n)$ then is 4.

15. [B] $x^2-8x+y^2=0 \rightarrow \quad (x-4)^2+y^2=16$. The radius is 4, and the circumference is 8π.

16. [C] For a parabola, $E=1$; for a hyperbola, $E>1$; for an ellipse, $0<E<1$, and for a circle, $E=0$.

17. [D] The normal term is "positive difference", but squaring the difference yields a positive constant that satisfies the definition.

18. [B] $a=5$, $c=3$, so then $b=4$. The area is $\pi ab=20\pi$.

19. [D] The vertex is in Quadrant II, and it will open into Quadrants I and IV. The focus is at $(-3,2)$ and the parabola crosses the *x*-axis at $(-3,0)$. So it also lies in Quadrant III.

20. [B] The circles' radius is $\frac{10}{\sqrt{\pi}}$, so its area is 100. The area of the triangle is the absolute value of

$$\frac{1}{2}\begin{vmatrix} -3 & 2 & 3 \\ -1 & -4 & 1 \\ 1 & 1 & 1 \end{vmatrix}=\frac{1}{2}\big(12+2-3-(-12-3-2)\big)=14.$$ The probability is $\frac{14}{100}=0.14$.

21. [A] The length of the latus rectum is $\frac{2\left(0.5N\right)^2}{0.5T}=\frac{N^2}{T}$, so $1<N<2<\frac{N^2}{T}$. The fact that all of these numbers are positive gives us some liberty when manipulating the inequality. To satisfy $2<\frac{N^2}{T}$, it must be true that $T<\frac{N^2}{2}$. Since $1<N$, $1<N^2$, and $\frac{1}{2}<\frac{N^2}{2}$. To guarantee a good value for *T*, it must be at most $\frac{1}{2}$. Anything more might violate the condition $T<\frac{N^2}{2}$.

22. [B] There are ${}_6C_4=\frac{6!}{4!\cdot 2!}=\frac{(6)(5)(4)(3)(2)}{(4)(3)(2)\cdot(2)}=15$ possible quadrilaterals.

23. [D] Draw in the line $y=1$ to get a triangle and a trapezoid.

24. [E] $m = -4$ and $n = -8$. Both lie on the horizontal real axis, and the slope of the line is 0.

25. [D] I'm getting tired of this *m* and *n* stuff! Let's just move this general case to the origin. The vertices are (0,0), $(-2,3)$, $(1,5)$, and $(3,K)$. The placement of the last on the right guarantees that (0,0) and $(1,5)$ are opposite, and the slope of this diagonal is 5. The slope of the other diagonal must be $-\frac{1}{5} \rightarrow \frac{K-3}{3+2} = \frac{-1}{5} \rightarrow K = -2$.

26. [D] The directrix is $y = -4$ and the axis of symmetry is $x = 4$. Since $mn = 0$, the focus is $(4,0)$. The vertex is between the focus and the directrix at $(4,-2)$. The equation of the parabola is $(x-4)^2 = 8(y+2)$, and only the last choice satisfies the equation.

27. [A] Manipulating, $x^2 + y^2 = 64$. Note, however, that the domain is restricted; x cannot be negative. So this is a **semi**circle of radius 8, and the length of the curve is 8π.

28. [A] The first equation rearranges to $\frac{x^2}{5} + \frac{y^2}{4} = 1$. The second rearranges to $-(x-2)^2 = y+2$. You can plug in the second equation's y-value into the first and brute force the answer. Or you can note that the vertical minor axis of the ellipse has a lower endpoint directly to the left of the parabola's vertex, and the parabola opens down, precluding any intersection possibility.

29. [C] The right triangle of concern has vertices (0,0), (0,10), and (*x*, 0). Since tangent is the ratio of the opposite leg over the adjacent leg, solve $\frac{2}{5} = \frac{x}{10}$.

30. [B] The distance is along a perpendicular line segment. Consider the perpendicular line $y = -\frac{1}{2}x$. It intersects the lines at (0,0) and $(-2,1)$. The distance between these points is $\sqrt{5}$.