Name: Key UID:

1. A
2. E
3. G
4. D
5. A (-2, -3)
6. $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$
7. $\begin{pmatrix} \frac{1}{2} & 0 \\ 0 & \frac{1}{3} \end{pmatrix}$
8. $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$
9. $(3, 6)$
10. $(3, -1)$
11. $(-10, 15)$
12. $(3, -1)$
13. $(3, 5)$
14. $(-3, 2)$
15. $(7, 11)$
16. 2
17. $\begin{pmatrix} 6 & -12 \\ 10 & -20 \end{pmatrix}$ (2pts)
18. 1
19. $\begin{pmatrix} \frac{1}{2} & \frac{-1}{2} \\ 1 & 0 \end{pmatrix}$ (2 pts)
20. $\mathbb{R}$
21. $[0, \infty)$
22. $(-\infty, 10)$
23. $\mathbb{R} - \{0\}$
24. $\mathbb{R}$

The remaining questions are worth 2 points. Solve the equations in the space provided below each question.

25. $2\log_9(x)^2 + \log_9(x) - 1 = 0$ (Write your answers to this problem as rational numbers in standard form.)

$\log_9(x) = \dfrac{-1+\sqrt{1+4(2)(1)}}{4} = \dfrac{-1+3}{4} = \dfrac{1}{2}$ OR $\log_9(x) = -1$

$\Downarrow$

$x = 9^{1/2} = 3$ $\qquad$ $x = 9^{-1} = \dfrac{1}{9}$

$\boxed{x = 3, x = \dfrac{1}{9}}$

26. $e^{x^2-100} + 1 = 0$

$e^{x^2-100} = -1$

No solutions because exponentials can't be negative.

27. $\sqrt{5x^2+2x-1}=2$

$5x^2+2x-1=4$

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

$b^2-4ac=4-4(5)(-5)=104$

$x=\frac{-2+\sqrt{104}}{10}$ $\quad x=\frac{-2-\sqrt{104}}{10}$

28. $x\log_e(3x-2)=x$ where $x>\frac{2}{3}$.

$\log_e(3x-2)=1$

$\frac{e+2}{3}>\frac{2}{3}$, so $\frac{e+2}{3}$ is in the domain.

$3x-2=e^1$

$3x=e+2$

$x=\frac{e+2}{3}$

Math 1060 Exam 1 February 20, 2015

Answer all questions below. All questions are worth 1 point except where otherwise noted. No cell phones, calculators, or notes are allowed during the exam. If you are stuck on a problem, skip it and come back to it later.

Name: _____ UID: _____

Write your answers to #1-24 on the answer sheet provided.

Planar Transformations

For #1-4 match each planar transformation with its geometric interpretation.

1. $\begin{pmatrix} 4 & 0 \\ 0 & 2 \end{pmatrix}$ A
2. $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ E
3. $A_{(4,2)}$ G
4. $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ D

A.) Scale x-coordinate by 4, y-coordinate by 2.
B.) Scale x-coordinate by 2, y-coordinate by 4.
C.) Flip over x-axis.
D.) Flip over y-axis.
E.) Flip over $y = x$ line.
F.) Moves points right 2, up 4.
G.) Moves points right 4, up 2.
H.) Does nothing.

For #5-8, give the inverse of the planar transformation.

5. $A_{(2,3)}$ $A_{(-2,-3)}$
6. $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$
7. $\begin{pmatrix} 2 & 0 \\ 0 & 3 \end{pmatrix}$ $\begin{pmatrix} \frac{1}{2} & 0 \\ 0 & \frac{1}{3} \end{pmatrix}$
8. $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$

Matrices and Vectors

For #9-15, find the resulting vector and write it as a row vector.

9. $(6,2)+(-3,4)$

$(3,6)$

10. $\begin{pmatrix}2\\4\end{pmatrix}-\begin{pmatrix}-1\\5\end{pmatrix}$

$\begin{pmatrix}3\\-1\end{pmatrix}$

11. $5(-2,3)$

$\begin{pmatrix}-10\\15\end{pmatrix}$

12. $A_{(1,3)}(2,-4) =$ $(3,-1)$

13. $\begin{pmatrix}0&1\\1&0\end{pmatrix}\begin{pmatrix}5\\3\end{pmatrix}$ $\begin{pmatrix}3\\5\end{pmatrix}$

14. $\begin{pmatrix}1&0\\0&-1\end{pmatrix}\begin{pmatrix}-3\\-2\end{pmatrix} = \begin{pmatrix}-3\\2\end{pmatrix}$

15. $\begin{pmatrix}2&3\\4&5\end{pmatrix}\begin{pmatrix}-1\\3\end{pmatrix} = \begin{pmatrix}-2+9\\-4+15\end{pmatrix} = \begin{pmatrix}7\\11\end{pmatrix}$

16. Compute $p_X(2,-4)$

2

17. Find the product: $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}\begin{pmatrix} -2 & 4 \\ 4 & -8 \end{pmatrix}$

$$\begin{pmatrix} -2+8 & 4-16 \\ -6+16 & 12-32 \end{pmatrix} = \begin{pmatrix} 6 & -12 \\ 10 & -20 \end{pmatrix}$$

18. Compute the determinant: $\det\begin{pmatrix} 3 & -1 \\ 2 & -\frac{1}{3} \end{pmatrix}$

$$3\cdot\left(\tfrac{-1}{3}\right) - (2)(-1)$$

$$= -1+2 = 1$$

19. (2 points) Find the inverse of $\begin{pmatrix} 0 & 1 \\ -2 & 1 \end{pmatrix}$.

$$\det = 0-(-2) = 2$$

$$\frac{1}{2}\begin{pmatrix} 1 & -1 \\ 2 & 0 \end{pmatrix} = \begin{pmatrix} \frac{1}{2} & \frac{-1}{2} \\ 1 & 0 \end{pmatrix}$$

Equations in One Variable
Find the implied domain of the following equations.

20. $x^2 - 3x + 3 = 0$

$\mathbb{R}$

21. $\sqrt{x} + 5 = \frac{1}{x+17}$

$x \geq 0$

$x \neq 17$

$[0, \infty)$

22. $e^{x^2-5x+2} = \log_{10}(10 - x)$

$10 - x > 0$

$10 > x$

$(-\infty, 10)$

23. $\log_e(x^2) + 5 = x^5 + 4x + 1$

$x^2 > 0 \Rightarrow x \neq 0$

$\mathbb{R} - \{0\}$

24. $e^{2x+5} = -10$

$\mathbb{R}$