Math 1320, Final Exam, 5/16/17, Version B

Directions: Turn off all cellphones, electronic music devices, etc. Basic function calculators *are permitted*, but calculators with graphing or algebraic functionality are not allowed. This exam has 21 multiple choice questions worth 1 point each and two short answer questions worth 2 points each. Be sure to answer all 23 questions!

---

1. (1 point) Find the solution to the following rational equation

$$\frac{7}{6t} = 2 + \frac{5}{3t}.$$

(A) -4 **(B)** $-\frac{1}{4}$ **(C)** -2 **(D)** $-\frac{1}{2}$ **(E)** There are no solutions.

---

2. (1 point) The sum of three consecutive integers is 102. Find the product of those three integers.
(A) 32 **(B)** 306 **(C)** 1056 **(D)** 39270 **(E)** 54270

---

3. (1 point) Use the quadratic formula to solve the equation $3x^2 + x - 7 = 0$ for x.
(A) $\left\{\frac{-1-\sqrt{85}}{6}, \frac{-1+\sqrt{85}}{6}\right\}$ **(B)** $\left\{\frac{-1-\sqrt{15}}{6}, \frac{-1+\sqrt{15}}{6}\right\}$ **(C)** $\left\{\frac{1-\sqrt{85}}{2}, \frac{1+\sqrt{85}}{2}\right\}$
(D) $\left\{\frac{-1-\sqrt{85}}{2}, \frac{-1+\sqrt{85}}{2}\right\}$ **(E)** $\{7, 7/3\}$

---

4. (1 point) Find the solution of the following rational inequality $\frac{y}{y+3} > 0$.
(A) $(-3, 0)$ **(B)** $(-3, \infty)$ **(C)** $(-\infty, -3) \cup (0, \infty)$ **(D)** $(-\infty, -3) \cup (3, \infty)$
(E) There are no solutions

---

5. (1 point) Find the midpoint of the line segment joining the points $(2, 6)$ and $(-4, -2)$.
(A) $(0, 0)$ **(B)** $(1, 3)$ **(C)** $(-2, 3)$ **(D)** $(2, 3)$ **(E)** $(-1, 2)$

---

6. (1 point) Find the x-intercept(s) of the graph of the equation $y = 9x^2 - 1$.
(A) $x = -1$ **(B)** $x = 3$ **(C)** $x = -1/3, 1/3$ **(D)** $x = -1/9, 1/9$ **(E)** There are none.

---

7. (1 point) Find the domain of the function $F(x) = \frac{x^2}{\sqrt{36 - x^2}}$.
(A) $(-\infty, \infty)$ **(B)** $(-\infty, -6) \cup (6, \infty)$ **(C)** $(36, \infty)$ **(D)** $[-6, 6]$ **(E)** $(-6, 6)$

---

8. (1 point) Let $f(x) = x^2$ and $g(x) = 1 + x$. Find $(f \circ g)(x)$.
(A) $(x+1)^2 + 1$ **(B)** $(x+1)^2$ **(C)** x^2 **(D)** $x^2 + 1$ **(E)** $x^2 + 2$

9. (1 point) Find the inverse function of $f(x) = \dfrac{1}{x+2}, \quad x \neq -2$.

(A) $f^{-1}(x) = \dfrac{1}{x} - 2;\ x \neq 0$ **(B)** $f^{-1}(x) = \dfrac{2}{x} + 2;\ x \neq 0$ **(C)** $f^{-1}(x) = \dfrac{3}{x} + 2;\ x \neq 0$
(D) $f^{-1}(x) = \dfrac{2}{x-2} + 2;\ x \neq 2$ **(E)** $f^{-1}(x) = \dfrac{1}{x-2} + 2;\ x \neq 2$

---

10. (1 point) If $x^3 - 4x^2 + x + 6$ is divided by $x^2 + x + 1$, find the quotient q and the remainder r.
(A) $q = x + 5$ and $r = x + 2$ **(B)** $q = x + 5$ and $r = 5x - 10$ **(C)** $q = x - 5$ and $r = 5x + 11$ **(D)** $q = x - 5$ and $r = 5x + 7$ **(E)** $q = 0$ and $r = x^2 + x + 1$

---

11. (1 point) The profit that a vendor makes per day by selling x pretzels is given by the function $P(x) = -4x^2 + 3200x - 350$. Find the number of pretzels that must be sold to maximize the profit.
(A) 400 pretzels **(B)** 800 pretzels **(C)** 1240 pretzels **(D)** 1600 pretzels **(E)** 639,650 pretzels

---

12. (1 point) Given that $(x + 2)$ is a factor of $P(x) = x^3 - 2x^2 - 5x + 6$, find all zeros of $P(x)$.
(A) $0, -2$ **(B)** $2, 3, i$ **(C)** $-2, i, 2i$ **(D)** $1, -2, 3$ **(E)** $-1, -2, -3$

---

13. (1 point) Evaluate the expression $\log_8 \sqrt{8}$.
(A) 1/8 **(B)** 1/2 **(C)** 1 **(D)** 8 **(E)** -1

---

14. (1 point) Find the value(s) of x that satisfy the equation

$$\log_7(4 - x) - \log_7(x + 2) = \log_7 x.$$

(A) -4 **(B)** 1 **(C)** 4 **(D)** 0 **(E)** 1 and 4

---

15. (1 point) Solve the system of linear equations $\begin{cases} -x + y - z &= -1 \\ x - y - z &= 3 \\ x + y - z &= 9 \end{cases}$.

(A) $(5, 3, -1)$ **(B)** $(3, 5, -1)$ **(C)** $(1, 3, 3)$ **(D)** $(-1, 3, 5)$ **(E)** No solution.

---

16. (1 point) Find the following partial-fraction decomposition

$$\frac{9x - 11}{(x - 3)(x + 5)} = \frac{A}{x - 3} + \frac{B}{x + 5}.$$

What is the value of B?
(A) $B = 0$ **(B)** $B = 5$ **(C)** $B = 7$ **(D)** $B = -1$ **(E)** $B = -11$

17. (1 point) Given the matrix

$$\left[\begin{array}{rrr|r} 1 & -4 & 1 & 5 \\ -5 & 0 & 5 & -2 \\ -1 & 2 & -3 & -1 \end{array}\right],$$

perform the matrix operation $-3R_1 + R_2 \to R_2$ and find the resulting matrix.

(A) $\left[\begin{array}{rrr|r} 16 & -4 & -14 & 11 \\ -5 & 0 & 5 & -2 \\ -1 & 2 & -3 & -1 \end{array}\right]$ **(B)** $\left[\begin{array}{rrr|r} 1 & -4 & 1 & 5 \\ -8 & 12 & 2 & -17 \\ -1 & 2 & -3 & -1 \end{array}\right]$ **(C)** $\left[\begin{array}{rrr|r} 1 & -4 & 1 & 5 \\ -8 & 12 & 2 & -17 \\ 0 & 0 & 1 & -4 \end{array}\right]$

(D) $\left[\begin{array}{rrr|r} 1 & -4 & 1 & 5 \\ -2 & -12 & 8 & 13 \\ -1 & 2 & -3 & -1 \end{array}\right]$ **(E)** $\left[\begin{array}{rrr|r} -8 & 12 & 2 & -17 \\ -5 & 0 & 5 & -2 \\ -1 & 2 & -3 & -1 \end{array}\right]$

18. (1 point) Perform the operation $A \times B$, where $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$.

(A) undefined **(B)** $\begin{bmatrix} 5 \\ 5 \end{bmatrix}$ **(C)** $\begin{bmatrix} 5 \\ 6 \end{bmatrix}$ **(D)** $\begin{bmatrix} 2 & 3 \\ 2 & 4 \end{bmatrix}$ **(E)** $\begin{bmatrix} 8 \\ 5 \end{bmatrix}$

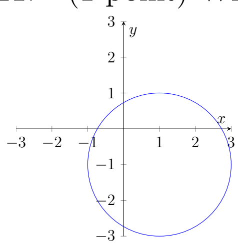
19. (1 point) Find the first four terms of the sequence defined by $a_1 = 2$ and $a_n = 2a_{n-1} - 1$ for $n \geq 2$.

(A) 3,5,9,11 **(B)** 2,3,5,9 **(C)** 2,3,5,7 **(D)** 2,3,4,5 **(E)** 2,4,8,16

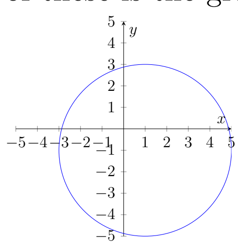
20. (1 point) Evaluate the infinite series $\frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \ldots$.

(A) 1 **(B)** 2/5 **(C)** 2 **(D)** 1/2 **(E)** 5/2

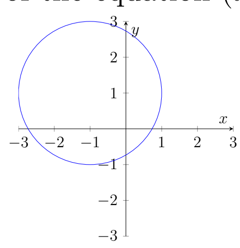
21. (1 point) Which of these is the graph of the equation $(x+1)^2 + (y-1)^2 - 4 = 0$?



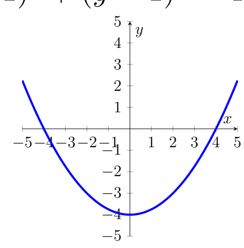
(A)



(B)



(C)



(D)

Short answer problems:

Give careful, detailed solutions in your bluebook. Be sure to show all your work and explain your reasoning.

22. (2 points) You deposit \$1200 into an account earning interest at a rate of 6% per year, compounded continuously. How long will it take for the account to reach \$2000?

23. (2 points) Sketch the graph of the function $f(x) = (x+2)^2 - 3$.

Useful formulas:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}.$$

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right).$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$y - y_0 = m(x - x_0) \quad \text{or} \quad y = y_0 + m(x - x_0)$$

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

$$f(x) = ax^2 + bx + c, \qquad \left(-\frac{b}{2a}, \frac{4ac - b^2}{4a} \right)$$

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

$$A = Pe^{rt}$$

$$N = N_0 e^{kt}$$

$$a_n = a_1 + d(n-1)$$

$$a_n = a_1 r^{n-1}$$

$$\sum_{n=0}^{\infty} a_1 \cdot r^n = a_1 \frac{1}{1-r}, \ \ |r| < 1$$