Math 1320, Final Exam, 5/14/18, Version A [1]

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) Which of these is equal to the product $(-4+2i)(1+i)$?
(A) $-6-2i$ **(B)** $6+2i$ **(C)** $1-3i$ **(D)** $3+4i$ **(E)** $4+2i$

---

2. (1 point) Divide the polynomial $x^3+4x^2-5x-48$ by $x-3$.
(A) x^2-3x+4 **(B)** $x^2+7x+16$ **(C)** x^2-x-5 **(D)** x^2-1 **(E)** x^2+4x-2

---

3. (1 point) Solve the equation $\log_2(x-4)=3$.
(A) $x=8$ **(B)** $x=36$ **(C)** $x=24$ **(D)** $x=10$ **(E)** $x=12$

---

4. (1 point) Find all solutions to the equation $x^2-3x-28=0$.
(A) $\{4,5\}$ **(B)** $\{-4,7\}$ **(C)** $\{2,7\}$ **(D)** $\{3,-8\}$ **(E)** $\{-4,3\}$

---

5. (1 point) The exponential model $A=150e^{0.025t}$ describes the population in millions A of a country t years after 2005. In what year will the population of the country reach 192 million?
(A) 2010 **(B)** 2015 **(C)** 2020 **(D)** 2025 **(E)** 2030

---

6. (1 point) Find the center and the radius of the circle given by $(x-3)^2+(y+3)^2=25$.
(A) center $(3,-3)$, radius 5 **(B)** center $(3,-3)$, radius 25 **(C)** center $(5,3)$, radius 3
(D) center $(1,2)$, radius 25 **(E)** center $(-1,1)$, radius 5/3

---

7. (1 point) Solve the system of equations

$$\begin{aligned} 2x^2-y^2 &= 16, \\ y-x &= 0. \end{aligned}$$

(A) $\{(4,4),(-4,-4)\}$ **(B)** $\{(4,-10),(3,10)\}$ **(C)** $\{(1,2),(3,-1)\}$ **(D)** $\{(0,0),(15,5)\}$
(E) $\{(4,8),(0,0)\}$

---

8. (1 point) Solve the following absolute value equation or indicate that it has no solution: $7|3x|+2=16$.
(A) $\emptyset$ **(B)** $\{-\frac{2}{3},\frac{2}{3}\}$ **(C)** $\{-\frac{3}{2},\frac{3}{2}\}$ **(D)** $\{6,-6\}$ **(E)** $\{-\frac{16}{21},\frac{16}{21}\}$

---

9. (1 point) Find the domain of the function $f(x)=\sqrt{x-3}+\sqrt{x+4}$.
(A) $(-4,3)$ **(B)** $[-4,3]$ **(C)** $[-4,\infty)$ **(D)** $[3,\infty)$ **(E)** $[-3,4]$

---

10. (1 point) Find the point(s) of intersection of the following lines: $3x-2y=-5$ and $4x+y=8$.
(A) $\{(3,2)\}$ **(B)** $\{-4,3)\}$ **(C)** $\{(1,4)\}$ **(D)** $\{(-8/5,2)\}$
(E) These lines do not intersect.

---

11. (1 point) A rectangular field is twice as long as it is wide. If the perimeter of the field is 1200 meters, what are its dimensions?
(A) length 400m, width 200m **(B)** length 200m, width 400m **(C)** length 80m, width 40m
(D) length 600m, width 600m **(E)** length 600m, width 300m

---

12. (1 point) Find the equation of the line passing through the two points $(-2,-5)$ and $(6,-7)$.
(A) $y=4x+3$ **(B)** $y=-4x-3$ **(C)** $y=\frac{-1}{4}x-\frac{11}{2}$ **(D)** $y=\frac{-1}{4}x+\frac{11}{2}$
(E) $y=\frac{1}{4}x-2$

---

13. (1 point) Which of these is equal to $\log(20)+\log(150)$?
(A) $\log(1/4)$ **(B)** $\log(170)$ **(C)** $\log(20+\log(120))$ **(D)** $\log(3000)$ **(E)** $\log(15/2)$

---

14. (1 point) Solve the linear inequality and express the solution set in interval notation: $2x+3\leq 4(x-1)-5$.
(A) $(-\infty,4]$ **(B)** $(-\infty,6)$ **(C)** $[4,\infty)$ **(D)** $[6,\infty)$ **(E)** $[4,6]$

---

15. (1 point) If $f(x)=3x-2$, find the inverse function $f^{-1}(x)$.
(A) $f^{-1}(x)=(x-3)/4$ **(B)** $f^{-1}(x)=(x+2)/3$ **(C)** $f^{-1}(x)=2x-3$
(D) $f^{-1}(x)=x/3$ **(E)** $f^{-1}(x)=(2-x)/3$

---

16. (1 point) Solve the following quadratic inequality and express the solution set in interval notation: $x^2-6x<-6$.
(A) $\left[\frac{3-\sqrt{3}}{2},\frac{3+\sqrt{3}}{2}\right]$ **(B)** $(3-\sqrt{3},3+\sqrt{3})$ **(C)** $\left(\frac{2-\sqrt{3}}{2},\frac{2+\sqrt{3}}{2}\right)$ **(D)** $[3-\sqrt{3},3+\sqrt{3}]$
(E) $\left[0,\frac{3+\sqrt{2}}{2}\right]$

---

17. (1 point) Solve the following system of linear equations and write the solution as an ordered triple:

$$\begin{aligned} x-y &= 2\\ x-y+z &= 8\\ y-z &= 8. \end{aligned}$$

(A) (4,2,16) **(B)** (16,14,6) **(C)** (12,10,14) **(D)** (1, -1, 6) **(E)** (-1, -1, 2)

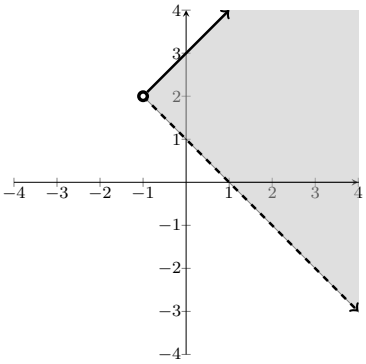
---

18. (1 point) Find the solution set for the equation $\frac{4x}{x+1}+\frac{4x}{x-1}=-1$.
(A) $\left\{\frac{1}{3},-\frac{1}{3}\right\}$ **(B)** $\left\{\frac{1}{2},-\frac{1}{2}\right\}$ **(C)** $\left\{\frac{1}{3},-\frac{1}{2}\right\}$ **(D)** $\{1,-1\}$ **(E)** $\{0\}$

---

19. (1 point) Consider the quadratic function $f(x)=-x^2+4x-4$. Which of these statements is ***false***?
(A) f has $x-$intercept $(2,0)$ **(B)** f has $y-$intercept $(0,-4)$ **(C)** f has vertex $(2,0)$
(D) f is an even function **(E)** The solution set for $f(x)=0$ is $\{2\}$

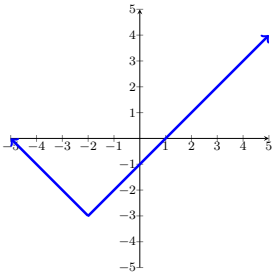
20. (1 point) Which system of inequalities describes the shaded area in the following figure?



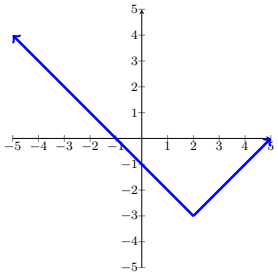
(A) $y < 3 + x$ and $y > -1 - x$ **(B)** $y \leq x + 3$ and $y > -x + 1$ **(C)** $y \leq 1 + x$ and $y > 2 - x$
(D) $y > 0$ and $y < 1 + x$ **(E)** $y > 3 + x$ and $y \leq -x + 1$

---

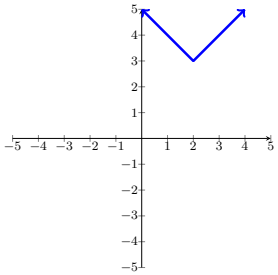
21. (1 point) Which of these is the graph of the function $g(x) = |x + 2| - 3$?



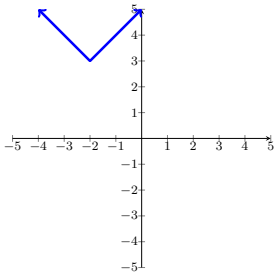
A



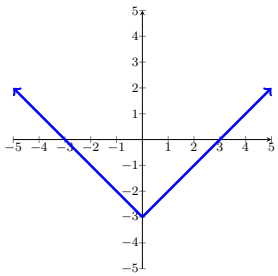
B



C



D



E

Short answer problems: Give careful, detailed solutions. Be sure to show all your work and explain your reasoning.

---

22. (2 points) A sum of \$10,000 is invested into an account paying 8% annual interest, compounded quarterly. Find the balance after 5 years.

---

23. (2 points) Use Mathematical Induction to prove that the following statement is true for every positive integer n:

$$4 + 8 + 12 + \cdots + 4n = 2n(n + 1).$$

Formulas:

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

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

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

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

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

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

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

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

$$\boxed{A = Pe^{rt}}$$

$$\boxed{A = A_0 e^{kt}}$$

$$\boxed{a_n = a_1 + d(n - 1)}$$

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

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