Washburn University Math Day Exam

1. Simplify: $2-(-8) \div (-2)$

    A) -5   B) -2   C) 0   D) 2   E) 4

2. Simplify: $-2[x-(3-x)]$

    A) 6   B) $4x-6$ C) -4x + 3   D) -4x + 6   E) $2x-3$

3. Evaluate: $2x-3y-x^2$ for x = -2 and y = -3

    A) -2   B) 1   C) 3   D) 5   E) -3

4. In a right triangle the length of the two short sides are $\sqrt{2}$ inches and 3 inches. What is the length in inches of the hypotenuse of the triangle?

    A) $\sqrt{2}+3$ B) 11   C) $\sqrt{11}$ D) 13   E) $\sqrt{13}$

5. Subtract: $-2x+3$ from $-3x-2$.

    A) $-x-5$ B) -x + 5   C) $5x-1$ D) -5x + 1   E) $5x-5$

6. Solve for x: $3(7-2x) = 14 - 8(x-1)$

    A) $\dfrac{3}{2}$ B) $-\dfrac{3}{2}$ C) 1   D) $-\dfrac{1}{2}$ E) $\dfrac{1}{2}$

7. Solve for x: $1-5x \le 16$

    A) $x \ge 3$ B) $x \le 3$ C) $x \ge -3$ D) $x \le -3$ E) $-3 \le x \le 3$

8. Expand: $(5x-2y)^2$

    A) $25x^2-4y^2$ B) $25x+4y^2$ C) $25x^2-10xy+4y^2$

    D) $25x^2+10xy+4y^2$ E) $25x^2-20xy+4y^2$

9. Simplify: $\dfrac{-24x^5y^2}{16x^2y^3}$

    A) $\dfrac{-3x^3}{2y}$ B) $\dfrac{-3x^3}{2}$ C.) $\dfrac{-3x^7}{2y^5}$ D) $\dfrac{3x^3}{2y}$ E.) $\dfrac{3x^3}{2}$

10. Reduce: $\dfrac{x^2-4}{2x-x^2}$

    A) $\dfrac{2}{x}$ B) $\dfrac{x-2}{x}$ C) $-\dfrac{x+2}{x}$ D) $\dfrac{x+2}{2x}$ E) $\dfrac{x+2}{2-x}$

11. A 6 foot man is standing 8 feet horizontally from the base of a light pole. If the man's shadow is 4 feet in length, how far off the ground is the light?

    A) 12 ft   B) 16 ft   C) 18 ft   D) 20 ft   E) 24 ft

12. Simplify: $2\sqrt{75}-3\sqrt{12}+\dfrac{6}{\sqrt{3}}$

    A) $\dfrac{3\sqrt{3}+6}{\sqrt{3}}$ B) $4\sqrt{3}$ C) $4\sqrt{2}$ D) $6\sqrt{3}$ E) $6\sqrt{2}$

13. Rationalize: $\dfrac{10x}{\sqrt[3]{25x}}$

    A) $\dfrac{2}{\sqrt[3]{5}}$ B) $\dfrac{2\sqrt[3]{25x}}{5}$ C) $\dfrac{2x\sqrt[3]{25x}}{5}$ D) $\dfrac{5x\sqrt[3]{25x}}{2}$ E) $2\sqrt[3]{5x^2}$

14. Simplify: $\dfrac{x+2}{x^2-9} - \dfrac{3}{x^2+3x}$

A) $\dfrac{x-1}{2x^2+3x-9}$

B) $\dfrac{x-1}{(x^2-9)(x^2+3x)}$

C) $\dfrac{x^2+2x-3}{x(x-3)(x+3)}$

D) $\dfrac{x+5}{x(x-3)}$

E) $\dfrac{x^2-x+9}{x(x-3)(x+3)}$

15. Divide and simplify: $\dfrac{x-y}{x^2+xy+y^2} \div \dfrac{x^2-y^2}{x^3-y^3}$

A) -1

B) $\dfrac{x+y}{x^2+xy+y^2}$

C) $\dfrac{x-y}{x^2+xy+y^2}$

D) $\dfrac{(x-y)^2}{x^2+xy+y^2}$

E) $\dfrac{x-y}{x+y}$

16 $8^{-\frac{2}{3}}$ equals:

A) $-\frac{16}{3}$ B) $-\frac{3}{16}$ C) $\frac{1}{4}$ D) $\frac{1}{16}$ E) $-8^{\frac{2}{3}}$

17. The sum of the solutions to $|2x-1| = 3$ is:

A) 1   B) 2   C) $\frac{5}{2}$ D) 3   E) $\frac{7}{2}$

18. The sum of the solutions to $12x^2 + x = 6$ is:

A) $\frac{1}{6}$ B) $-\frac{1}{12}$ C) $-\frac{1}{4}$ D) $\frac{1}{8}$ E) $\frac{5}{24}$

19. The slope of the line perpendicular to 3x - 2y = 7 is:

A) $-\frac{3}{2}$ B) $\frac{3}{2}$ C) $\frac{2}{3}$ D) $-\frac{2}{3}$ E) $-\frac{2}{7}$

20. The quotient of the complex numbers $(2 + 4i) \div (1 - i)$ simplifies to:

    A) $1 + 3i$ B) $-1 + 3i$ C) $2 - 3i$ D) $2 + 3i$ E) $3 - 2i$

21. The y co-ordinate of the vertex of the parabola $y = x^2 - 4x + 5$ is:

    A) 5   B) 3   C) 2   D) 1   E) -5

22. The radius of the circle $x^2 + y^2 + 4x - 2y - 4 = 0$ is :

    A) 1   B) 3/2   C) 2   D) 5/2   E) 3

23. The inverse function of $f(x) = 2^x$ is:

    A) $f^{-1}(x) = x^2$ B) $f^{-1}(x) = \log_2 x$ C) $f^{-1}(x) = 2x$ D) $f^{-1}(x) = \dfrac{x}{2}$ E) $f^{-1}(x) = \dfrac{2}{x}$

24. $\dfrac{(n+1)!}{(n-1)!}$ simplifies to:

    A) $n^2 - n$ B) $n^2 + n$ C) $\dfrac{1}{n-1}$ D) $\dfrac{1}{n^2 - n}$ E) $\dfrac{1}{n^2 + n}$

25. If $\log_{10} a = 2.1$ and $\log_{10} b = 3.1$ then $\log_{10}\left(\dfrac{ab^2}{\sqrt{10}}\right)$ simplifies to:

    A) 7.3   B) 7.5   C) 7.7   D) 7.8   E) 7.9

26. If $f(x) = 2x - 3$ then for $h \neq 0$, $\dfrac{f(x+h) - f(x)}{h}$ simplifies to:

    A) 2   B) $\dfrac{2x + h - 3}{h}$ C) $\dfrac{2x + 3}{h}$ D) $\dfrac{2x + 2h}{h}$ E) $\dfrac{x + h}{h}$

27. The infinite repeating decimal 1.393939… can be expressed as a reduced fraction a/b where a + b equals:

   A) 237　　　　　B) 219　　　　　C) 139　　　　　D) 122　　　　　E) 79

28. If sin(x) = 3/5 with $\pi/2 \le x \le \pi$ then tan(x) equals:

   A) $\dfrac{3}{4}$　　　　B) $-\dfrac{3}{4}$　　　　C) $\dfrac{4}{3}$　　　　D) $-\dfrac{4}{3}$　　　　E) $-\dfrac{5}{3}$

29. The expression $\tan(x) \div \left[\sin^3(x) + \sin(x)\cos^2(x)\right]$ simplifies to:

   A) csc(x)　　　　B) sec(x)　　　　C) cot(x)　　　　D) sin(x)　　　　E) $\dfrac{\tan(x)}{\cos(x)}$

30. In a "single elimination golf tournament" pairs of players are matched and the loser of each match is out of the tournament. The winners are successively rematched. One loss and a player is eliminated from the tournament. In a game with 256 players, how many games are played?

   A) 16　　　　　B) 32　　　　　C) 64　　　　　D) 127　　　　　E) 255

31. Three marksman simultaneously shoot and hit a rapidly spinning spherical target. What is the probability that the three points of impact lie on the same hemisphere?

   A) 0　　　　　B) 1/3　　　　　C) ½　　　　　D) 2/3　　　　　E) 1

32. Two men play a card game and the stake is 1 penny per game. At the end, one man has won 3 pennies and the other man has won exactly 3 games (but has won no pennies). How many games did they play?

   A) 3　　　　　B) 6　　　　　C) 9　　　　　D) 12　　　　　E) 15

33. Assuming that the infinite expression $\sqrt{12 + \sqrt{12 + \sqrt{12 + ...}}}$ equals some number that number is:

   A) 4　　　　　B) 12　　　　　C) 24　　　　　D) 48　　　　　E) over 100

34. Mary can paint a room in 5 hours, but it takes Bill 8 hours to do it. How long would it take both Mary and Bill to paint the room working together?

    A) 3 hrs   B) $3\frac{1}{13}$ hrs   C) $3\frac{1}{7}$ hrs   D) $3\frac{1}{4}$ hrs   E) $3\frac{1}{2}$ hrs

35. A farmer bought 749 sheep. He sold 700 of them for the same total price he paid for the original 749. The remaining 49 sheep were sold at the same price per head as the other 700. Based on cost, the percent gain on the entire transaction is:

    A) 2 %   B) 4 %   C) 5 %   D) 7 %   E) 14 %

36. An engineer whose height is 5'10" is standing in a hole which he is digging. His boss asks him, "How deep are you going to dig the hole?" The engineer responds "I am one-third done and when I am finished my head will be twice as far below the ground as it is now above the ground." How deep will the engineer's hole be when he is finished digging?

    A) 8 ft   B) 9 ft   C) 10 ft   D) 10 ½ ft   E) 12 ft

37. When I am as old as my father is now, I shall be 5 times as old as my son is now. By then my son will be 8 years older than I am now. The combined ages of my father and myself are 100 years. How old is my son?

    A) 7   B) 9   C) 11   D) 13   E) 15

38. There are 100 cars in a parking lot, each with a unique 3 digit license number. At 5:00 the cars begin to leave. What is the probability that the first 4 cars to leave the lot have license numbers that are increasing in magnitude?

    A) $\frac{1}{100}$ B) $\frac{1}{48}$ C) $\frac{1}{24}$ D) $\frac{1}{64}$ E) less than $\frac{1}{100}$

39. In a pasture, an unfenced 2-acre plot of land is in the shape of a right triangle. There is a post at the midpoint of each side of the triangle. A sheep is tethered to each of the side posts and a dog to the post on the hypotenuse. The ropes are just long enough to let each animal reach the two adjacent vertices. What is the total area in which either sheep can graze and be safe from the dog?

    A) 1 acre   B) 2 acres   C) 4 acres   D) π acres   E) $\pi/2$ acres

40. For a (faulty) clock, the hour and minute hand point in exactly the same direction every 65 minutes. In one hour (of correct time) the clock:

A) loses $29/66$ minutes   B) loses $13/66$ minutes   C) gains $35/12$ minutes   D) gains $23/120$ minutes   E) gains $60/143$ minutes