

3pts 1. If  $A = \{10, 30, 45, 60, 65\}$  and  $B = \{10, 20, 30, 45, 55\}$  find  $A \cup B$

$$A \cup B = \{10, 20, 30, 45, 55, 60, 65\}$$

3pts 2. Rewrite the expression below in a form that does not use absolute values

$$|x-4| + |x-3| \quad \text{if } x > 4$$

$$x-4 + x-3$$

$$2x-7$$

3pts 3. Simplify using positive exponents:  $\frac{(x^3y^4z^5)^2}{x^4y^3z^2} \div \frac{x^2z^3}{y^5}$

$$\frac{x^6y^8z^{10}}{x^4y^3z^2} \cdot \frac{y^5}{x^2z^3} = y^{10}z^5$$

3pts 4. Write the following in scientific notation and show your work:  $(4.20 \times 10^{15})(5.10 \times 10^{-8})$

$$(4.2)(5.10) \times (10^7)$$

$$21.4 \times 10^7$$

$$2.14 \times 10^8$$

3pts 5. Simplify the following:  $\sqrt[3]{4x^4y^{15}z^{-4}} \sqrt[3]{2x^8y^{-3}z^{13}}$

$$\sqrt[3]{8x^{12}y^{12}z^9} = 2x^4y^4z^3$$

3pts 6. Rationalize the denominator and simplify:  $\frac{2x}{\sqrt[3]{5x^2y^7}} \cdot \frac{\sqrt[3]{25xy^2}}{\sqrt[3]{25xy^2}} = \frac{2x \sqrt[3]{25xy^2}}{5xy^3}$

3pts 7. Perform the indicated operation and simplify:  $(x+3)(x^2-3x+9)$

$$x(x^2-3x+9) + 3(x^2-3x+9)$$

$$x^3-3x^2+9x+3x^2-9x+27 = x^3+27$$

$$\frac{2 \sqrt[3]{25xy^2}}{5xy^3}$$

4pts 8. Factor by grouping:  $x^2 + 9x - a^2 - 9a$

$$(x^2 - a^2) + (9x - 9a)$$

$$(x-a)(x+a) + 9(x-a)$$

$$(x-a)(x+a+9)$$

4pts 9. Factor completely:  $x^2 - 3x - 18$

$$(x-6)(x+3)$$

4pts 10. Factor completely:  $2x^3y^2 + 250y^2$

$$2y^2(x^3+125) = 2y^2(x+5)(x^2-5x+25)$$

4pts 11. Simplify:  $\frac{\left(\frac{x^2+6x+5}{x^2-1}\right)}{\left(\frac{x^2+7x+10}{x^2+4x-5}\right)}$

$$\frac{(x+5)(x+1)}{(x+1)(x-1)} \cdot \frac{(x-1)(x+5)}{(x+2)(x+5)} = \frac{x+5}{x+2}$$

4pts 12. Solve:  $\frac{3}{x-2} + \frac{1}{x+1}$

$$\frac{3(x+1) + (x-2)}{(x-2)(x+1)} = \frac{3x+3+x-2}{(x-2)(x+1)} = \frac{4x+1}{(x-2)(x+1)}$$

4pts 13. Solve:  $\left|\frac{4x-1}{3}\right|=2$

$$\frac{4x-1}{3} = 2$$

$$4x-1 = 6$$

$$4x = 7 \quad \boxed{x = 7/4}$$

OR

$$\frac{4x-1}{3} = -2$$

$$4x-1 = -6$$

$$4x = -5$$

$$\boxed{x = -5/4}$$

4pts 14. Solve for  $\mu$ :  $Z = \frac{x-\mu}{\sigma}$

$$Z\sigma = x - \mu$$

$$\boxed{\mu = x - Z\sigma}$$

4pts 15. Solve  $3x^2 + 5x - 2 = 0$  by using the quadratic formula

$$x = \frac{-5 \pm \sqrt{25 - 4(3)(-2)}}{6} = \frac{-5 \pm 7}{6} = -2 \text{ or } \frac{1}{3}$$

$$\boxed{x = -2 \text{ or } 1/3}$$

$$x = \frac{-5 \pm \sqrt{25 - 4(3)(-2)}}{6}$$

$$x = \frac{-5 \pm \sqrt{49}}{6} = \frac{-5 \pm 7}{6}$$

4pts 16. Solve:  $\frac{4}{x} + \frac{3}{x-1} = 5$

$$4(x-1) + 3(x) = 5(x)(x-1)$$

$$4x-4+3x = 5x^2-5x$$

$$5x^2-12x+4 = 0$$

$$(5x-2)(x-2) = 0$$

$$\boxed{x = 2 \text{ or } 2/5}$$

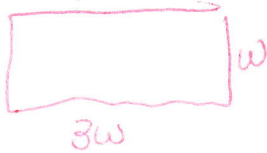
4pts 17. Solve  $\sqrt{x-5} + 2 = x - 3$

$$\begin{aligned} \sqrt{x-5} &= x-5 \\ x-5 &= x^2 - 10x + 25 \\ 0 &= x^2 - 11x + 30 \end{aligned}$$

$$(x-6)(x-5) = 0$$

$$\boxed{x=5 \text{ or } x=6}$$

4pts 18. A rectangular garden is three times as long as it is wide. Find its dimensions if the total area is 192 square yards.



$$\begin{aligned} (3w)(w) &= 192 \\ w^2 &= 64 \\ w &= \pm 8 \end{aligned}$$

$8 \text{ yds} \times 24 \text{ yds}$   
wide long

4pts 19. A change purse contains 17 coins worth a total of \$2.50. The coins are all quarters, nickels, or dimes. The number of nickels and dimes are equal. There are two more quarters than nickels. How many of each type of coin are in the change purse?

$$\begin{aligned} Q + N + D &= 17 & Q &= N + 2 \\ N &= D \end{aligned}$$

so  $Q + 2N = 17$

so  $3N + 2 = 17 \quad N = 5$

5 Nickels	.25
5 Dimes	.50
7 Quarters	1.75
<u>17</u>	<u>2.50</u> ✓

There are 5 nickels  
5 dimes  
7 quarters

4pts 20. Specify the solutions for the following in interval notation:  $\frac{x+2}{3} - \frac{x}{4} \geq 1$

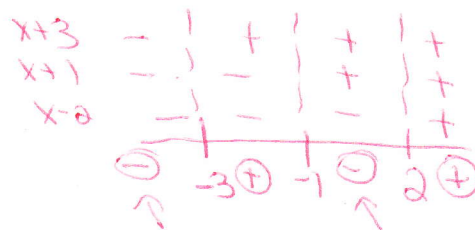
$$\begin{aligned} 4(x+2) - 3x &\geq 12 \\ 4x + 8 - 3x &\geq 12 \\ x &\geq 4 \end{aligned}$$

$[4, \infty)$

4pts 21. Solve using the critical point method (write solution with interval notation)

$$\frac{x^2 + 4x + 3}{x - 2} \leq 0$$

$$\frac{(x+1)(x+3)}{x-2} \quad \text{crit } -1, -3, 2$$

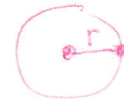


$(-\infty, -3] \cup [-1, 2)$

5pts 22. Find the equation of the circle with center (11, -1) and a point on the circle (17, -9).

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

$$(x-11)^2 + (y+1)^2 = 100$$



Center to pt on circle is r

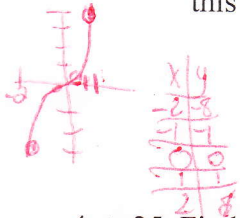
$$d = \sqrt{(6)^2 + (-8)^2}$$

$$\sqrt{100}$$

$$d = 10$$

4pts 23. Graph  $5x + 2y = 10$  see below

5pts 24. Graph  $y = x^3$  and determine if there is any symmetry (x, y, origin). Explain algebraically why this is so.



$$y = (x)^3$$

$$y = -x^3$$

no y

$$-y = x^3$$

no x  
= y^m

$$(-y) = (-x)^3$$

$$-y = -x^3$$

$$y = x^3$$

yes

Origin Symm.  
Since both x & y when replaced by -x & -y give same eqn

4pts 25. Find the equation of the line through (2, 5) that is parallel to  $2x - 3y = 4$ .

$$y - 5 = m(x - 2)$$

$$y - 5 = \frac{2}{3}(x - 2)$$

$$2x - 3y = 4$$

$$3y = 2x - 4$$

$$y = \frac{2}{3}x - \frac{4}{3}$$

$m = \frac{2}{3}$   $m_{par} = \frac{2}{3}$   
parallel

5pts 26. Water freezes at 0° Celsius or 32° Fahrenheit. It boils at 100° Celsius or 212° Fahrenheit. Use this information to determine the linear equation that will convert Celsius temperature to Fahrenheit.

0	32
100	212

$$m = \frac{212 - 32}{100 - 0} = \frac{9}{5}$$

$$F = mC + b$$

y x

$$F = \frac{9}{5}C + 32$$

Some formulas you may need

1.  $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

2.  $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

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

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

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

6.  $m_1 = m_2$

7.  $y - y_1 = m(x - x_1)$

8.  $(x - h)^2 + (y - k)^2 = r^2$

9.  $y - y_1 = m(x - x_1)$

10.  $y = mx + b$

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

12.  $m_1 = \frac{-1}{m_2}$

x	y
0	5
2	0
4	-5

# 23

$$5x + 2y = 10$$

