

No books and no notes. Be sure to set up each problem before evaluation. Show all work in the space provided for full credit.

1. Evaluate the following: (8 points)

$$\frac{2x^2 - 3x - 2}{(x+1)(7x+1)} \div \frac{(x-2)(x+3)}{7x^2 + 8x + 1} \Rightarrow \frac{2x^2 - 3x - 2}{(x+1)(7x+1)} \cdot \frac{7x^2 + 8x + 1}{(x-2)(x+3)} \Rightarrow \frac{(2x+1)(x-2)}{(x+1)(7x+1)} \cdot \frac{(7x+1)(x+1)}{(x-2)(x+3)}$$

$$\frac{2x+1}{x+3} \quad \checkmark$$

2. Simplify the following complex fractions. (8 points)

$$y^2 \left( \frac{\frac{4}{y} + \frac{8}{y^2}}{\frac{6}{y} + \frac{12}{y^2}} \right) \Rightarrow \frac{4y+8}{6y+12} \Rightarrow \frac{4(y+2)}{6(y+2)} \Rightarrow \frac{4}{6} \Rightarrow \frac{2}{3} \quad \checkmark$$

3. Solve the equation and give the domain and the solution set. (12 points)

$$\frac{5}{x-3} - \frac{3}{x+3} = \frac{4}{x^2-9} \Rightarrow \frac{5(x+3) - 3(x-3)}{(x+3)(x-3)} = \frac{4}{(x+3)(x-3)} \Rightarrow \frac{5x+15-3x+9}{(x+3)(x-3)} = \frac{4}{(x+3)(x-3)}$$

$$\frac{2x+24}{(x+3)(x-3)} = \frac{4}{(x+3)(x-3)} \Rightarrow \frac{2x+20}{(x+3)(x-3)} = 0$$

$$D: \{x \mid x \neq \pm 3\}$$

4. Find the missing number in the proportion. (12 points)

a)  $\left(\frac{k}{12}\right) = \left(\frac{4}{3}\right)$   $\Rightarrow k = 16$

b)  $\left(\frac{y}{15}\right) = \left(\frac{30}{45}\right)$   
 $3y = 30$   
 $y = 10$

5. The current in a simple electrical circuit is inversely proportional to the resistance. If the current is 5 Amperes when the resistance is 20 ohms, find the current when the resistance is 25 ohms. (10 points)

[Hint:  $y = \frac{k}{x}$ : y varies inversely as x.]

$$5 = \frac{k}{20} \Rightarrow k = 100$$

$$C = \frac{100}{25} = 4 \text{ amperes} \quad \checkmark$$

6. Assume all variables represent positive real numbers. Simplify the following (if possible): (12 points)

a)  $\sqrt[3]{-\frac{27}{64}} = \sqrt[3]{(-1)\left(\frac{27}{64}\right)} \Rightarrow \frac{\sqrt[3]{27}}{\sqrt[3]{64}} \Rightarrow \frac{3}{4}i$

b)  $\sqrt[4]{81x^3y} - \sqrt[4]{16x^7y} = 3\sqrt[4]{x^3y} - 2x\sqrt[4]{x^3y} = (3-2x)\sqrt[4]{x^3y}$

7. Rationalize the denominator in the following expression. (8 points)

$\frac{(2+\sqrt{3})(\sqrt{7}+\sqrt{3})}{(\sqrt{7}-\sqrt{3})(-\sqrt{7}+\sqrt{3})} \Rightarrow \frac{2\sqrt{7}+\sqrt{21}+2\sqrt{3}+3}{7-3} \Rightarrow \frac{2\sqrt{7}+\sqrt{21}+2\sqrt{3}+3}{4}$

8. Solve each equation and give the solution set. (16 points)

a)  $(x+10)^2 = 6$

$x+10 = \pm\sqrt{6}$

$x = 10 + \sqrt{6}$  or  $x = 10 - \sqrt{6}$

$\{x \mid x = 10 \pm \sqrt{6}\}$

b)  $(a-4)^3 = 8$

$a-4 = \sqrt[3]{8}$

$a-4 = 2$

$a = 4+2$  or  $a = 4-2$

$a = 6$  or  $a = 2$

$\{a \mid a = 6 \text{ or } a = 2\}$

9. Write the following in standard form. (16 points)

a)  $(8-i)(5-2i)$

$= 40 - 5i - 16i + 2i^2$

$= 40 - 21i + 2(-1)$

$= 38 - 21i$

b)  $\frac{(3i)(5+4i)}{(5-4i)(5+4i)} \Rightarrow \frac{15i+12i^2}{25-16i^2} =$

$\frac{15i+12(-1)}{5-16(-1)} \Rightarrow \frac{-12+15i}{17} =$

$\frac{4}{17} + \frac{5i}{17}$