

Math 140a - Practice Midterm #1

1) Let $S = [-5, 6)$ and $T = (2, 6]$. Sketch the following subsets of \mathbb{R} on the number line provided.

S

T

$S \cap T$

$S \cup T$

2) Let $S = [-3, 8)$ and $T = (4, 10]$. Sketch the following subsets of \mathbb{R} on the number line provided.

S

T

$S \cap T$

$S \cup T$

3) Give interval notation for the subset of \mathbb{R} which can be described in set-builder notation by the following.

$$\{ x \mid |x + 4| > 5 \}$$

4) Describe the interval $[3, 17]$ using set-builder notation and absolute values.

5) Simplify the following exponential and radical expressions. Assume all variables represent positive numbers.

a. $\left(\frac{xy^{-2}}{z^3}\right)^{-3} \left(\frac{1}{x^4z^2}\right)^5$

b. $\frac{(9st)^{3/2}}{(27s^3t^{-4})^{2/3}}$

c. $(48)^{-1/4}$

d. $4x\sqrt{50xy^2} + 3y\sqrt{2x^3}$

e. $\sqrt[3]{-8a^5bc^{10}} \cdot \sqrt[4]{a^2b^2}$

f. $(pq^4)^2(2p)^3(q^3)^{-3}$

6) Factor completely.

a. $(x+1)^{3/2} + x^2(x+1)^{1/2} + 2x(x+1)^{-1/2}$

b. $x^3 + 2x^2 - 9x - 18$

c. $(3x+4)^{7/2} - (3x+4)^{3/2}$

d. $(x-4)x^3 + 4x(4-x)$

e. $4t^4 - 12t^2s^2 + 9s^4$ Hint: First factor $4x^2 - 12xy + 9y^2$

7) Simplify the following fractional expressions.

a. $\frac{2x^2 + 3x + 1}{x^2 + 2x - 15} \div \frac{x^2 + 6x + 5}{2x^2 - 7x + 3}$

b. $\frac{\frac{1}{a+h} - \frac{1}{a}}{h}$

c. $x - \frac{y}{\frac{x}{y} + \frac{y}{x}}$

d. $\frac{x}{x^2 + x - 2} - \frac{2}{x^2 - 5x + 4}$

e. $\frac{\frac{x+h}{x+h-1} - \frac{x}{x-1}}{h}$

f. $\frac{1}{x+1} - \frac{2}{(x+1)^2} + \frac{3}{x^2-1}$

8) Solve the given equation.

a. $(x-2)^{1/2} - 9(x-2)^{-3/2} = 0$

b. $3x^3 + 6x^2 - 10x = 0$

c. $2y^2 + 10 = 7(1 - y)$

d. $y^3 - 5y^2 + y - 5 = 0$

e. $|4x + 1| = 9$

f. $x - \sqrt{x + 23} = -3$

g. $\frac{4}{x - 2} = 2 - \frac{6}{(x - 2)^2}$

h. $\frac{-21}{2x^2 - x - 6} + \frac{3}{2x + 3} = \frac{x - 5}{x - 2}$