

# Assignment 1

Complete this assignment after you have finished Unit 1, and submit your work to your tutor for grading.

This assignment has one bonus question. There is no penalty if you do not attempt it but you may be rewarded if you do. The maximum grade you can obtain in this assignment is 100%.

Total points: **100**

Weight: **5%**

## (4 points)

1. Use the prime decomposition of integers to express the listed radical in its minimal expression. Do not use decimals.

a.  $\sqrt{220500}$

b.  $\sqrt[3]{68600}$

c.  $\sqrt[3]{3267}\sqrt{4400}$

d.  $\sqrt{1125} + \sqrt{2420}$

## (8 points)

2. Fill in the table below. Note that you should refer to the section titled “Intervals” on pages 337–338 of the textbook and to Table 1 on page 338.

Interval	Inequality	Representation on the Real Line
	$x \leq -1$	
		$\circ \longrightarrow$ $\sqrt{3}$
$(-3, \pi)$		
	$\frac{3}{5} \leq x$	

## (6 points)

3. Give the intervals that correspond to the inequalities listed below.

a. All real numbers  $x$  so that  $x \geq -2$ .

b. All real numbers  $x$  so that  $0 < x \leq \frac{8}{3}$  and  $x \leq 2$ .

c. All real numbers  $x$  so that  $x > 3$  or  $-6 \leq x$ .

**(9 points)**

4. In each of the following exercises, rewrite and simplify the given expression. Give your answer using positive exponents only.

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

b.  $(uv^2w^3 - 3u^2w)^2(v^{-2})$

c.  $(\sqrt{x^3} + x^2y^{-2}z)(xy^2z^3)$

**(9 points)**

5. In each of the following exercises, expand and simplify.

a.  $\sqrt{2}(3x - \sqrt{2}x^2 + 1) - \sqrt{18}(1 - 4x)^3$

b.  $(t - u)^2 + 5(3t - u + 4u^2)(1 + u)$

c.  $(1 - 3x + x^2)^3(2 - 2x^2)$

**(9 points)**

6. In each of the following exercises, factor the given expressions.

a.  $2y^3 + 6y^2 + y + 3$

b.  $3x^2 - 18xy + 24y^2$

c.  $50x^3 + 20x^2 + 2x$

**(12 points)**

7. In each of the following exercises, factor and simplify the terms, and then do the indicated operations.

a.  $\frac{1}{9x^2 - y^2} - \frac{12x^2 - 10xy + 2y^2}{9x^2 - 6xy + y^2}$

b.  $\frac{\sqrt{x^2 + 5x + 4}}{x^2 + 8x + 16} - \frac{x^2 - 3x - 4}{x^2 - 16}$

c.  $\left(\frac{9x^3 + 6x^2 + x}{27x^3 + 1}\right)\left(\frac{6x - 1}{3x^2 + x}\right)$

**(12 points)**

8. Determine which of the equations given below have real solutions and give the solutions of those that do.

a.  $2x^2 + 3x = 6$

b.  $x^4 + 6x^2 - 3 = 0$

**Hint.** Set  $a = x^2$  and express the equation in terms of  $a$ .

c.  $3x = 12x^2 - 5x$

d.  $\frac{x^2 + 7x}{3} = -\frac{5}{2}$

e.  $\frac{3x^2 + 3}{2} = x$

**(9 points)**

9. a. Rationalize the numerator of  $\frac{\sqrt{2}-6}{5+\sqrt{2}}$ .
- b. Rationalize the denominator of  $\frac{5x-2}{\sqrt{2+x}-\sqrt{6x}}$ .
- c. Rationalize the denominator of  $\frac{\sqrt{8xy^3}+5\sqrt{y}}{2y-\sqrt{y}}$ .

**(6 points)**

10. Convert from radians to degrees the numbers given below. Note that you should refer to the section titled “Angles” on pages 358–359 of the textbook.

- a.  $\frac{\pi}{5} + \frac{3\pi}{8}$
- b.  $\frac{7\pi}{4} - \sqrt{2}\pi$

**(6 points)**

11. Convert from degrees to radians for the numbers given below.

- a.  $\left(\frac{38}{3}\right)^\circ$
- b.  $\left(\frac{90}{5}\right)^\circ$

**(10 points)**

12. Give the exact value of

- a.  $\tan\left(\frac{7\pi}{6}\right)$
- b.  $\cos\left(\frac{5\pi}{8}\right)\sin\left(\frac{5\pi}{8}\right)$
- c.  $\cos^2\left(\frac{\pi}{8}\right)$

**Bonus. (8 points)**

13. In Unit 1 of the study guide we defined the trigonometric functions using a right triangle with hypotenuse 1. Use similar triangles to define in any right-angle triangle with hypotenuse  $z$  the trigonometric functions as

$$\cos \theta = \frac{x}{z} \quad \sin \theta = \frac{y}{z} \quad \tan \theta = \frac{y}{x}$$

**Hint.** The circle below has radius 1.

