

Skills Test

Please show all your work NEATLY. At end of work, indicate your final answer by putting a box around it. You may not work with a tutor or a partner. You may use your notes or book, but please do this test in one sitting and indicate at the top of the paper how long it took. The time you take will not affect my scoring.

Write your name here, but make no other marks on this page. Thank you for your cooperation. Good luck!

Name _____

	1.1	1.2	2.3	2.4	3.5	3.6	4.7	4.8	4.9
Page									
Points									

1. Give 2 examples each of each number set:

a. Integers $\mathbb{Z}$

$$\boxed{-2, 17}$$

b. Irrationals $\mathbb{Q}'$

$$\boxed{\pi, e}$$

True or false:

c. All rationals $\mathbb{Q}$ can be expressed as a repeating decimal.

I

d. Any real number $\mathbb{R}$ can be expressed as a complex number $\mathbb{C}$.

I

e. The set of integers $\mathbb{Z}$ contains all natural numbers $\mathbb{N}$.

I

2. Simplify by eliminating the negative exponent, eliminating or reducing the radical, combining like terms, and so on. Also, solve if possible (ex. $3^2 = 9$)

a. $2^{-3}/5^{-1} = \boxed{5/8}$

b. $-4^{-1} = \boxed{-1/4}$

c. $(-4)^{-2} = \boxed{1/16}$

d. $\sqrt[5]{64} = \boxed{2}$

e. $\sqrt[3]{-1000} = \boxed{-10}$

f. $81^{3/4} - 27^{2/3} = \cancel{8}27 - 9 = \boxed{18}$

g. $-3\sqrt{7} + 12\sqrt{28} = -3\sqrt{7} + 12 \cdot 2\sqrt{7} = \boxed{21\sqrt{7}}$

h. $\left(\frac{b^{-3}}{64a^{-1/2}}\right)^{-2/3} = \left(\frac{64a^{-1/2}}{b^{-3}}\right)^{2/3} = \frac{64^{2/3}a^{-1/3}}{b^{-2}} = \boxed{\frac{16b^2}{a^{1/3}}}$

3.a) Rewrite the radical as an exponential expression:

$$\sqrt[5]{4y^7} = (4y^7)^{1/5}$$

$$\sqrt{3-y^2} = (3-y^2)^{1/2}$$

b) Rewrite the exponential expression as a radical:

$$c^{-3/4} = \sqrt[4]{c^{-3}}$$

$$-2x^{2/3} = -2\sqrt[3]{x^2}$$

c) Simplify

$$\sqrt[4]{x^9 y^{20}} = x^2 y^5 \sqrt[4]{x}$$

$$\sqrt{-9a^4 b^8} = 3ia^2 b^4$$

d) Simplify

$$2\sqrt{32x^2 y^3} - xy\sqrt{98y} = 8xy\sqrt{2y} - 7xy\sqrt{2y} = xy\sqrt{2y}$$

$$\sqrt{(9+x)^2} = 9+x^2$$

4. Add, subtract, multiply, or divide

$$a) \frac{5x}{3x^2-x-2} - \frac{2x}{x^2-1} = \frac{5x(x+1) - 2x(3x+2)}{(3x+2)(x+1)(x-1)} = \frac{-x^2+x}{(3x+2)(x^2-1)}$$

$$b) \frac{6}{x^3-8} \div \frac{4}{2-x} = \frac{-3(x-2)}{2(x^2+x+2)(x-2)} = \frac{-3}{2(x^2+x+2)}$$

5. Show $x+3$ is not a factor of $P(x) = x^3 - 2x^2 + x + 60$, via long division.

$$\begin{array}{r}
 x^2 - 5x + 16 + 12/x+3 \quad \leftarrow \text{Ans} \\
 x+3 \overline{) x^3 - 2x^2 + x + 60} \\
 \underline{-(x^3 + 3x^2)} \\
 -5x^2 + x \\
 \underline{-(-5x^2 - 15x)} \\
 16x + 60 \\
 \underline{-(16x + 48)} \\
 12
 \end{array}$$

$P(3) = \underline{53}$, hence, $x=3$ is not a root of $P(x)$.

6. Solve for x .

a)
$$x - \frac{12}{x-3} = \frac{x}{3-x}$$
 LCD = $-(x-3)$

$$-(x-3) + 12 = x$$

$$-x + 3 + 12 = x$$

$$2x = 15$$

$$\boxed{x = 15/2}$$

b)
$$\frac{4x}{x+1} - \frac{x}{x^2-1} = \frac{-6}{1-x^2}$$
 LCD = $-(x^2-1)$

$$-4x(x-1) + x = -6 \quad -4x^2 + 5x + 6 = 0$$

$$(4x+3)(x-2) = 0 \quad \boxed{x = -3/4, 2}$$

7. Rationalize the denominator

$$a) \frac{3}{\sqrt{x}-2} \cdot \frac{\sqrt{x}+2}{\sqrt{x}+2} = \boxed{\frac{3\sqrt{x}+6}{x-4}}$$

$$b) \frac{12x}{\sqrt[3]{2x}} \cdot \frac{\sqrt[3]{2x}}{\sqrt[3]{2x}} \cdot \frac{\sqrt[3]{2x}}{\sqrt[3]{2x}} = \frac{12x\sqrt[3]{4x^2}}{2x} = \boxed{6\sqrt[3]{4x^2}}$$

8. Simplify as needed

$$a) i^{17} = \boxed{i}$$

$$b) i^{2003} = i^3 = \boxed{-i}$$

$$c) \frac{4+i}{2-i} \cdot \frac{2+i}{2+i} = \frac{8+6i-i^2}{4-i^2} = \boxed{\frac{9+6i}{5}}$$

$$d) \sqrt{-100m^4} + \sqrt{-64m^6} = \boxed{10im^2 + 8im^3}$$

$$e) \sqrt{-15} \sqrt{-3} = \sqrt{-1(15)} \sqrt{-1(3)} = i\sqrt{15} i\sqrt{3} \\ = i^2 \sqrt{45} = -1 \cdot 3\sqrt{5} \\ = \boxed{-3\sqrt{5}}$$

9. a) Solve $\sqrt{3x+1} - 1 = x$

$$\sqrt{3x+1} = x+1$$

$$3x+1 = x^2+2x+1$$

$$x^2-x=0$$

$$x(x-1)=0$$

$$x=0, 1$$

Both check
(need to show)

b) Solve $x^4 - 6x^2 + 8 = 0$

$$(x^2-2)(x^2-4)=0$$

$$x = \pm\sqrt{2}, \pm 2$$