Quiz 4 Review Sheet

Notes: No calculators will be allowed on the quiz. (But you won't have to factor huge numbers like 1728.)

If your answer would be an imaginary number, write "imaginary" as the answer.

1. Evaluate:
   (a) $36^{\frac{1}{2}}$ (b) $27^{(-\frac{2}{3})}$
   (c) $(2^4)^{-\frac{3}{4}}$ (d) $3^7 3^{-9} 3^2$
   (e) $\left(\frac{270}{13}\right)^0$ (f) $\left(\sqrt[3]{7}\right)^3$
   (g) $\sqrt[4]{-16}$ (h) $\sqrt[3]{-8}$
2. (a) Convert $17^{\frac{2}{7}}$ to radical form; (b) convert $\sqrt[5]{(-2)^3}$ to exponential form.
3. Knowing that $7056 = 2^4 3^2 7^2$, evaluate $\sqrt{7056}$.
4. Simplify the following radicals:
   (a) $\sqrt[4]{x^{11}}$ (b) $\sqrt[5]{(-7)^5}$
   (c) $\sqrt[3]{16}$ (d) $\sqrt[2]{27a^2}$
   (e) $\sqrt[3]{4} \cdot \sqrt[3]{4}$ (f) $\frac{\sqrt{60}}{\sqrt{3}}$
   (g) $\sqrt{3a} \cdot \sqrt{12a}$ (h) $\sqrt{2} \cdot \sqrt[5]{3} \cdot \sqrt{6}$
5. Fill in the blanks:
   (a) $2^{-5} \cdot \boxed{} = 2^7$ (b) $\sqrt[2]{5} \cdot \boxed{} = 5$
6. Evaluate:
   (a) $|2-7+3|$ (b) $|2| - |7| + |3-5|$
   (c) $\Big||3-5| - 6\Big|$ (d) $-|-3| + |3-4| \cdot (-5)$
7. Find the natural form of:
   (a) $(-2)^3$ (b) 2^{-5}
   (c) $(-8)^{\frac{1}{3}}$ (d) $\frac{1}{2^{-3}}$
   (e) $\left(\frac{2}{5}\right)^{-2}$ (f) $(-3)^{-2}$
8. Graph $y = |x-2| - 3$.

Exponent techniques

✳ For exponents/roots, **"Find the natural form"** or **"Evaluate"** means you need to convert what you're given into a number or fraction. For instance, $\sqrt{4}$ is equal to 2, and 3^3 is equal to 27.

If you *don't* have any fractional powers or roots, you can find the answer directly.

(for instance, $2^{-3} = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$)

If you *do* have fractional powers/roots, we have some techniques:

➢ Factor the base, or write it as a power.

➢ Use exponent laws:

$$\boxed{n^a n^b = n^{a+b}} \quad \boxed{(n^a)^b = n^{ab}}$$

example: $8^{\frac{2}{3}} = (2^3)^{\frac{2}{3}} = 2^{3 \cdot \frac{2}{3}} = 2^2 = 4.$

✳ **"Simplify radicals"** means changing radicals to have the smallest possible number inside. Techniques for this:

➢ Factor all numbers completely

➢ Pull out numbers or variables from the radical, if possible:

example: $\sqrt[3]{\underbrace{5 \times 5 \times 5}_{5} \times \underbrace{5}_{\sqrt[3]{5}}} = 5 \cdot \sqrt[3]{5}.$

➢ Combine radicals using the multiplicative law:

example: $\sqrt{3} \cdot \sqrt{12} = \sqrt{3 \cdot 12} = \sqrt{36} = 6.$

List of exponent/radical rules on the back ➥

Exponent Rules

Rule	*Example*
$n^0 = 1$ if n is not zero	$3^0 = 1$
$n^{-a} = \dfrac{1}{n^a}$	$x^{-2} = \frac{1}{x^2}$
additive law: $n^a n^b = n^{a+b}$	$13^2 \cdot 13^3 = 13^5$
multiplicative law: $(n^a)^b = n^{ab}$	$(y^{-\frac{2}{3}})^6 = y^{(-\frac{2}{3}\cdot 6)} = y^{-4}$
$(a \cdot b)^n = a^n \cdot b^n$	$(2x)^2 = 2^2 x^2 = 4x^2$
$\left(\dfrac{a}{b}\right)^n = \dfrac{a^n}{b^n}$	$\left(\dfrac{3}{4}\right)^3 = \dfrac{3^3}{4^3} = \dfrac{27}{64}$

Radical Rules

Rule	*Example*
multiplicative law: $\sqrt[n]{a \cdot b} = \sqrt[n]{a} \cdot \sqrt[n]{b}$	$\sqrt[2]{9 \cdot 5} = \sqrt[2]{9} = \sqrt[2]{5} = 3 \cdot \sqrt[2]{5}$
	$\sqrt[3]{4} \cdot \sqrt[3]{16} = \sqrt[3]{4 \cdot 16} = \sqrt[3]{2^2 \cdot 2^4} = \sqrt[3]{2^6} = 2^2.$

Converting Radicals/Exponents

Rule	*Example*
$\sqrt[n]{a} = a^{\frac{1}{n}}$	$\sqrt[7]{11} = 11^{\frac{1}{7}}$
$\sqrt[n]{a^b} = a^{\frac{b}{n}}$	$(-15)^{\frac{2}{3}} = \sqrt[3]{(-15)^2}$