Math 4 Honors
Critical Skills Review

Name $\underline{\text{Answer Key}}$
Date $\underline{\hspace{4cm}}$

No Calculator

Basic skills you must have mastered in order for you to succeed in this course:

Rules for Exponents

$$(4x)^3 = 64x^3 \qquad (-2xy^2z^4)^5 = -32x^5y^{10}z^{20} \qquad -3x^4 * -8x^6 = 24x^{10}$$

$$x^{-3} = \frac{1}{x^3} \qquad \frac{x^{23}}{x^{30}} = x^{-7} = \frac{1}{x^7} \qquad x^{\frac{3}{4}} = \sqrt[4]{x^3} \qquad 4x^{\frac{-1}{5}} = \frac{4}{\sqrt[5]{x}} \qquad \frac{2}{\sqrt[4]{x}} = 2x^{-\frac{1}{4}}$$

If $f(x) = -x^4$, find $f(3)$. -81

Squaring a Binomial $(a+b)^2 = a^2 + 2ab + b^2 \qquad (a-b)^2 = a^2 - 2ab + b^2$

$$(2x+3)^2 = 4x^2 + 12x + 9 \qquad (3x-5)^2 = 9x^2 - 30x + 25$$

Product of Two Conjugates $(a+b)(a-b) = a^2 - b^2$

$$(x+8)(x-8) = x^2 - 64 \qquad (2x-5)(2x+5) = 4x^2 - 25$$

Factoring

$$7x^2 - 56x = \qquad\qquad x^2 - 23x = \qquad\qquad a^3b^4 + a^2b^9 - a^5c^4 =$$
$$7x(x-8) \qquad\qquad x(x-23) \qquad\qquad a^2(ab^4 + b^9 - a^3c^4)$$

$$x^2 - 5x + 6 = \qquad\qquad x^2 + 10x + 16 = \qquad\qquad x^2 - 81 =$$
$$(x-3)(x-2) \qquad\quad (x+8)(x+2) \qquad\quad (x+9)(x-9)$$

$$7x^2 - 17x - 12 = (7x+4)(x-3)$$

Simplifying Rational Expressions

$$\frac{x+16}{8} = \qquad\qquad \frac{5}{0} = \emptyset \qquad\qquad \frac{5x^3 - 10x^2}{x^4} = \frac{5x^2(x-2)}{x^4 \cdot x^2}$$

Already simplified $\qquad\qquad\qquad\qquad\qquad\qquad = \frac{5(x-2)}{x^2}$

$$\frac{1}{\cancel{8}} \cdot \frac{8x+11}{\cancel{24}4} = \boxed{\frac{8x+11}{4}} \qquad \frac{5}{3x} + \frac{x}{4} = \text{LCD: } 12x \qquad \frac{\frac{1}{y}}{x+y} = \frac{1}{y} \cdot \frac{1}{x+y}$$

$$\frac{5}{3x} \cdot \frac{4}{4} + \frac{x}{4} \cdot \frac{3x}{3x} = \qquad\qquad \text{OVER} \rightarrow$$

$$\frac{20}{12x} + \frac{3x^2}{12x} = \qquad\qquad = \boxed{\frac{1}{y(x+y)}}$$

$$\boxed{\frac{20 + 3x^2}{12x}}$$

Solving equations by using the Zero-Product Property

Factor first!

$$2x(x+16)=0 \qquad x^2+11x-42=0 \qquad x^3-64x=0$$

$2x=0 \quad x+16=0$
$X=0 \qquad X=-16$

$(X+14)(X-3)=0$
$X+14=0 \quad X-3=0$
$X=-14 \qquad X=3$

$X(X^2-64)=0$
$X(X+8)(X-8)=0$
$X=0 \quad X=-8 \quad X=8$

Find the exact values.

See next slide for the Unit Circle.

$$\cos(\pi) = \ -1 \qquad \sin\left(\frac{\pi}{2}\right) = \ 1 \qquad \tan\left(\frac{\pi}{4}\right) = \ 1$$

Slope-Intercept Form of an Equation

Write the equation of the line going through the points (-5, -18) and (1, -6) in slope-intercept form.

$$m = \frac{-6+18}{1+5} = \frac{12}{6} = 2$$

$y = 2x + b$
$-6 = 2\cdot 1 + b$
$-6 = 2 + b$
$b = -8$

(Line ‖ to the line has slope of 2.)
(Line ⊥ to the line has slope of -½.)

$$y = 2x - 8$$

Additional Topics and Terminology

Function
Domain
Range
Zeros of a Function
Inverse
Asymptote
Logarithm
Unit Circle
Sine/Cosine/Tangent
Quadratic Formula
Rational Exponents
Imaginary Numbers
Geometric Formulas, Theorems & Definitions

COS ⇒ x   tan ⇒ $\frac{y}{x}$
Sin ⇒ y

$\frac{\pi}{2}$
(0,1)

$\frac{2\pi}{3}$
$(-1/2, \sqrt{3}/2)$ 90° $\frac{\pi}{3}$
                                            $(1/2, \sqrt{3}/2)$

$\frac{3\pi}{4}$ 120°   60° $\frac{\pi}{4}$
$(-\sqrt{2}/2, \sqrt{2}/2)$ 135°   45° $(\sqrt{2}/2, \sqrt{2}/2)$

$\frac{5\pi}{6}$ (−,+)   (+,+) $\frac{\pi}{6}$
$(-\sqrt{3}/2, 1/2)$ 150°   30° $(\sqrt{3}/2, 1/2)$

                    II   I

π 180°   0° 2π
(−1,0)   360°   (1,0)
          210°

                    III   IV

$\frac{7\pi}{6}$ (−,−)   (+,−) $\frac{11\pi}{6}$
$(-\sqrt{3}/2, -1/2)$ 225°   330° $(\sqrt{3}/2, -1/2)$

$\frac{5\pi}{4}$ 240°   315° $\frac{7\pi}{4}$
$(-\sqrt{2}/2, -\sqrt{2}/2)$ 270°   300° $(\sqrt{2}/2, -\sqrt{2}/2)$

          $\frac{4\pi}{3}$ $\frac{5\pi}{3}$
          $(-1/2, -\sqrt{3}/2)$ $(1/2, -\sqrt{3}/2)$

                    (0,−1)
                    $\frac{3\pi}{2}$