COLLEGE ALGEBRA EXAM 1 LG   NAME_____

SHOW ALL WORK ON THIS TEST OR ON SEPARATE PAPER. Circle answers.
TURN IN <u>ALL</u> WORKSHEETS. GRAPHING CALCULATORS ARE REQUIRED ON
THIS TEST.   (WHEN CALCULATORS ARE USED, SKETCH THE GRAPH,
DESCRIBE THE WINDOW, OR OTHERWISE INDICATE WHAT YOU DID!!)

In 1 - 4, factor completely and simplify if possible:

1. $2x^4 - 54x$

2. $(x+2y)^2 - 10(x+2y) + 25$

3. $x^5 + 9x^4 - 4x - 36$

4. $(x^2 - 7x)^2 + 16(x^2 - 7x) + 60$

5. $x^{\frac{3}{2}} - 36x^{\frac{1}{2}}$

6. $x^3 - 16x^{-1}$

7.   **Simplify:** $\dfrac{x}{x^2 - 4} + \dfrac{2}{x^2 - 6x + 8} - \dfrac{1}{x^2 - 2x - 8}$

1

8.   **Simplify:** $[3x^{-1} - (3y)^{-1}]^{-2}$

In 9 – 12, give simplest radical form. Rationalize all denominators.

9a) $\sqrt{250x^7 y^9}$ b) $\sqrt[3]{250x^7 y^9}$ 10a) $\sqrt{46} \cdot \sqrt{69}$ b) $\sqrt[3]{98} \cdot \sqrt[3]{14}$

11. $\dfrac{15}{\sqrt{72x^3}}$ 12. $\dfrac{5\sqrt{3} + 2\sqrt{6}}{5\sqrt{3} - 2\sqrt{6}}$

In 13 – 16, solve the equations for x. (Give complex or radical form when appropriate.)

13. $|2x - 3| = |x + 6|$ 14. $x^2 + 20 = 4x$

15. $x^2 = 4(x+2)$

16. $\dfrac{x}{x-1} + \dfrac{2}{x-5} = \dfrac{-4}{(x-1)(x-5)}$

In 17 – 19, use a calculator to calculate the value. Give scientific notation or round to nearest hundredth.

17a) $\sqrt{1,000,000}$

18a) $\dfrac{4.5 \cdot 10^8}{5.4 \cdot 10^{-8}}$
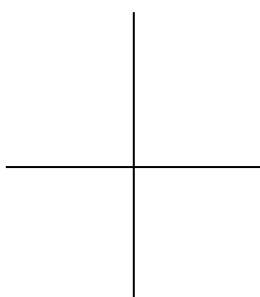
19a) Give scientific notation: 0.0000042

b) $\sqrt[5]{1,000,000}$

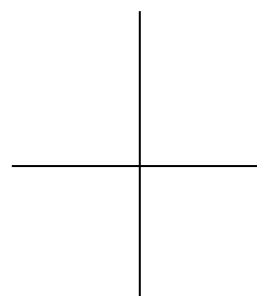**b)** $\sqrt[3]{\dfrac{3500 \cdot 850}{0.0042 \cdot 98}}$

b) Give in the form a+bi: $\dfrac{9+16i}{2-8i}$

(Fractional form)
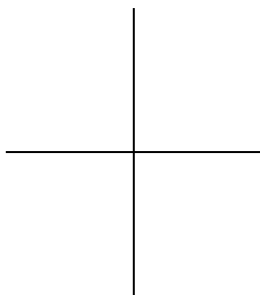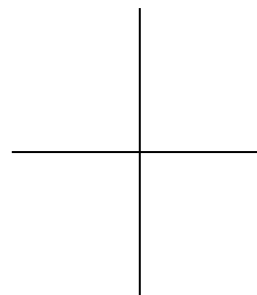
In 20 – 21, graph each of the following.

20a) y = x^2

21a) $y = |x|$

b)   y = - x^2

b) $y = |x+4|$

3

22. $\sqrt{x+4} - \sqrt{3x} = -2$ **23.** $(x^2 - 6x)^2 + 13(x^2 - 6x) + 40 = 0$

24. $\dfrac{x^2 - 12}{x} - \dfrac{20x}{x^2 - 12} = 1$

1. $2x^4 - 54x$

$2x(x^3 - 27)$

$\boxed{2x(x-3)(x^2+3x+9)}$

2. $(x+2y)^2 - 10(x-2y) + 25$

$(x+2y-5)(x+2y-5)$

$\boxed{(x+2y-5)^2}$

3. $x^5 + 9x^4 - 4x - 36$

$x^4(x+9) - 4(x+9)$

$(x+9)(x^4-4)$

$\boxed{(x+9)(x^2-2)(x^2+2)}$

4. $(x^2-7x)^2 + 16(x^2-7x) + 60$

$(x^2-7x+10)(x^2-7x+6)$

$\boxed{(x-5)(x-2)(x-6)(x-1)}$

5. $x^{3/2} - 36x^{1/2}$

$\boxed{x^{1/2}(x-36)}$

6. $x^3 - 16x^{-1}$

$x^{-1}(x^4-16)$

$x^{-1}(x^2-4)(x^2+4)$

$\boxed{\dfrac{(x-2)(x+2)(x^2+4)}{x}}$

7. $\dfrac{x}{(x-2)(x+2)} + \dfrac{2}{(x-4)(x-2)} - \dfrac{1}{(x+2)(x-4)}$

$\dfrac{x}{(x-2)(x+2)(x-4)}\dfrac{(x-4)}{} + \dfrac{2}{(x-4)(x-2)(x+2)}\dfrac{(x+2)}{} - \dfrac{1}{(x+2)(x-4)(x-2)}\dfrac{(x-2)}{}$

$\dfrac{x^2-4x + 2x+4 - x+2}{(x-2)(x+2)(x-4)}$

$\boxed{\dfrac{x^2-3x+6}{(x-2)(x+2)(x-4)}}$

8. $[3x^{-1} - (3y)^{-1}]^{-2}$

$\left[\dfrac{3}{x} - \dfrac{1}{3y}\right]^{-2}$

$\left[\dfrac{9y-x}{3xy}\right]^{-2}$

$\left(\dfrac{3xy}{9y-x}\right)^2$ or $\boxed{\dfrac{9x^2y^2}{(9y-x)^2}}$

9a) $\sqrt{250x^7y^9}$

$\sqrt{25x^6y^8}\sqrt{10xy}$

$\boxed{5x^3y^4\sqrt{10xy}}$

b) $\sqrt[3]{250x^7y^9}$

$\sqrt[3]{125x^6y^9}\sqrt[3]{2x}$

$\boxed{5x^2y^3\sqrt[3]{2x}}$

10a) $\sqrt{46}\,\sqrt{69}$

$\sqrt{23\cdot 2 \cdot 23 \cdot 3}$

$\boxed{23\sqrt{6}}$

b) $\sqrt[3]{98}\cdot\sqrt[3]{14}$

$\sqrt[3]{2\cdot 7^2 \cdot 2 \cdot 7}$

$\boxed{7\sqrt[3]{4}}$

11. $\dfrac{15}{\sqrt{72x^3}} = \dfrac{15}{\sqrt{36x^2}\sqrt{2x}}\cdot\dfrac{\sqrt{2x}}{\sqrt{2x}}$

$= \dfrac{\overset{5}{\cancel{15}}\sqrt{2x}}{\underset{2}{\cancel{6}}x\cdot 2x} = \boxed{\dfrac{5\sqrt{2x}}{4x^2}}$

12. $\dfrac{(5\sqrt{3}+2\sqrt{6})}{(5\sqrt{3}-2\sqrt{6})}\dfrac{(5\sqrt{3}+2\sqrt{6})}{(5\sqrt{3}+2\sqrt{6})}$

$= \dfrac{25\cdot 3 + 10\sqrt{18} + 10\sqrt{18} + 4\cdot 6}{25\cdot 3 - 4\cdot 6}$

$= \dfrac{75 + 24 + 20\sqrt{18}}{75 - 24}$

$= \dfrac{99 + 60\sqrt{2}}{51}$
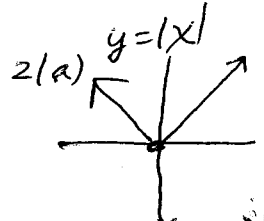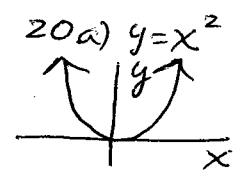
$= \dfrac{3(33 + 20\sqrt{2})}{51}$

$= \boxed{\dfrac{33 + 20\sqrt{2}}{17}}$

13. $|2x-3| = |x+6|$

$2x-3 = x+6$ or $2x-3 = -x-6$

$\boxed{x=9}$ $3x = -3$

$\boxed{x=-1}$

14. $x^2 - 4x + \underline{} = -20 + \underline{}$

$x^2 - 4x + 4 = -20 + 4$

$(x-2)^2 = -16$

$x - 2 = \pm\sqrt{-16}$

$\boxed{x = 2 \pm 4i}$

15. $x^2 = 4x + 8$

$x^2 - 4x + \underline{} = 8 + \underline{}$

$x^2 - 4x + 4 = 8 + 4$

$(x-2)^2 = 12$

$x - 2 = \pm\sqrt{12}$

$\boxed{x = 2 \pm 2\sqrt{3}}$

16. $\dfrac{x}{\cancel{x-1}}(x-1)(x-5) + \dfrac{(x-1)(x-5)}{\cancel{x-5}} = \dfrac{(x-1)(x-5)}{(x-1)(x-5)}$

$\dfrac{x}{\cancel{x-1}} + \dfrac{}{\cancel{x-5}} = \dfrac{}{\cancel{(x-1)}\cancel{(x-5)}}$

$x^2 - 5x + 2x - 2 = -4 \quad (x\neq 1,5)$

$x^2 - 3x + 2 = 0$

$(x-3)(x-1) = 0$

$\boxed{x=2}$ $x=1$ Reject.

17a) $\boxed{1000}$

b) $\boxed{15.85}$

18a) $\boxed{8.3 \times 10^{15}}$

b) $\boxed{1.9 \times 10^2 \approx 193.35}$

19a) $\boxed{4.2 \times 10^{-6}}$

b) $\boxed{-\dfrac{55}{34} + \dfrac{26}{17}i}$

20a) $y = x^2$

20b) $y = -x^2$

21a) $y = |x|$

21b) $y = |(x+4)|$
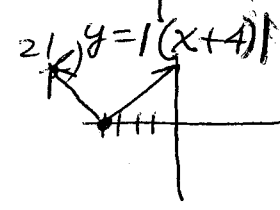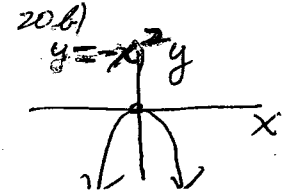
22. $\sqrt{x+4} - \sqrt{3x} = -2$

$\sqrt{x+4} = -2 + \sqrt{3x}$

$(\sqrt{x+4})^2 = (-2 + \sqrt{3x})^2$

$x+4 = 4 - 4\sqrt{3x} + 3x$

$\underline{-3x-4 \qquad -4 \qquad\qquad -3x}$

$-2x = -4\sqrt{3x}$

$(\div -2) \quad \dfrac{-2x}{-2} = \dfrac{-4\sqrt{3x}}{-2}$

$(x)^2 = (2\sqrt{3x})^2$

$x^2 = 4 \cdot 3x$

$x^2 - 12x = 0$

$x(x-12) = 0$

$x = 0 \quad x = 12$

$Ck: x = 0$

$\sqrt{4} - \sqrt{0} = -2 \qquad$ ⬭ $x = 12$

$2 = -2 \qquad\qquad \sqrt{16} - \sqrt{36} = -2$

Reject! $\qquad\qquad 4 - 6 = -2$

$\qquad\qquad\qquad\qquad -2 = 2$ ✓

23. $(x^2-6x)^2 + 13(x^2-6x) + 40 = 0$

$[(x^2-6x) + 8][(x^2-6x) + 5] = 0$

$(x^2-6x+8)(x^2-6x+5) = 0$

$(x-4)(x-2)(x-5)(x-1) = 0$

⬭ $x=4 \quad x=2 \quad x=5 \quad x=1$

24. $\dfrac{x^2-12}{x} - \dfrac{20x}{x^2-12} = 1$

Let $u = \dfrac{x^2-12}{x} \qquad \dfrac{1}{u} = \dfrac{x}{x^2-12}$

$u\left(u - 20 \cdot \dfrac{1}{u}\right) = u(1)$

$u^2 - 20 = u$

$u^2 - u - 20 = 0$

$(u-5)(u+4) = 0$

$u = 5 \qquad u = -4$

$x \cdot \dfrac{x^2-12}{x} = \dfrac{x}{5} \qquad x\,\dfrac{x^2-12}{x} = \dfrac{x}{-4}$

$x^2 - 12 = 5x \qquad\qquad x^2 - 12 = -4x$

$x^2 - 5x - 12 = 0 \qquad x^2 + 4x - 12 = 0$

$a=1 \; b=-5 \; c=-12 \qquad (x+6)(x-2) = 0$

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a} \qquad$ ⬭ $x = -6 \quad x = 2$

$= \dfrac{5 \pm \sqrt{(5)^2 - 4(1)(-12)}}{2(1)}$

$= \dfrac{5 \pm \sqrt{25+48}}{2} =$ ⬭ $\dfrac{5 \pm \sqrt{73}}{2}$