

Name: Key
 Math 121, College Algebra – Crawford

Exam 1 - Form A
 01 March 2017

Score

1	/4
2	/4
3	/10
4	/10
5	/10
6	/14
7	/12
8	/18
9	/6
10	/6
11	/10
Total	/100

- Books, notes (in any form), cell phones, and any unauthorized sources are **not** allowed.
- Calculators are **not** allowed on Part I.
- You may use a calculator on Part II.
- Clearly indicate your answers.
- **Show all your work** – partial credit may be given for written work.
- Good Luck!

Part I Calculators are **not** allowed on Part I. [Turn in Part I by 1:20pm.]
 You must completely finish Part I and turn it in before you work on Part II.

1. (4 pts). Evaluate and simplify the following. Reduce fractions, if possible

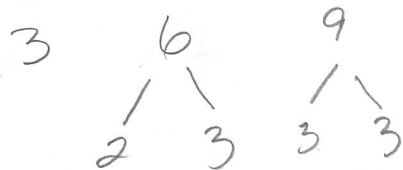
$$\frac{2}{3} - \frac{1}{6} + \frac{5}{9}$$

$$= \frac{2}{3} \cdot \frac{6}{6} - \frac{1}{6} \cdot \frac{3}{3} + \frac{5}{9} \cdot \frac{2}{2}$$

$$= \frac{12}{18} - \frac{3}{18} + \frac{10}{18}$$

$$= \frac{12 - 3 + 10}{18}$$

$$= \boxed{\frac{19}{18}}$$



$$\text{LCD: } 2 \cdot 3^2 = 2 \cdot 9 = 18$$

2. (4 pts). Evaluate and simplify the following.

$$\begin{aligned}
 4 - 2 \cdot |3 - 6| &= 4 - 2 \cdot |-3| \\
 &= 4 - 2(3) \\
 &= 4 - 6 \\
 &= \boxed{-2}
 \end{aligned}$$

3. (10 pts).

(a). Rewrite the following expression with positive exponents and simplify.

$$\begin{aligned}
 (a^{-2}b^3)^{-3} \cdot (2a^3b)^2 &= \frac{1}{(a^{-2}b^3)^3} \cdot (2a^3b)^2 \\
 &= \frac{1}{a^{-6}b^9} \cdot 4a^6b^2 \\
 &= \frac{a^6}{b^9} \cdot \frac{4a^6b^2}{1} \rightarrow \boxed{\frac{4a^{12}}{b^7}}
 \end{aligned}$$

(b). Rewrite the following using fractional exponents. Then perform the operation and simplify.

Your answer should not contain radicals and should have only positive exponents.

[Assume nonnegative variables.]

$$\begin{aligned}
 \sqrt[3]{x^2} \cdot \sqrt{x} &= x^{2/3} \cdot x^{1/2} \\
 &= x^{2/3 + 1/2} \\
 &= x^{4/6 + 3/6} \\
 &= \boxed{x^{7/6}}
 \end{aligned}$$

Part II You must completely finish Part I and turn it in before you may use a calculator on Part II. Show all of your work and clearly indicate your answers. Calculator Number:

4. (10 pts). Factor completely.

(a). $x^2 + 2x - 8$

$$(x+4)(x-2)$$

(b). $8x^4 + 6x - 12x^3 - 9$ [Factor by grouping.]

$$2x(4x^3+3) - 3(4x^3+3)$$

$$(4x^3+3)(2x-3)$$

5. (10 pts). Perform the following operations and simplify.

(a). $(2x - y^2)^2 = (2x)^2 - 2(2x)(y^2) + (y^2)^2$

$$= 4x^2 - 4xy^2 + y^4$$

(b). $(1+x-2x^2)(3x^2-2) = 1(3x^2-2) + x(3x^2-2) - 2x^2(3x^2-2)$

$$= 3x^2 - 2 + 3x^3 - 2x - 6x^4 + 4x^2$$

$$= -6x^4 + 3x^3 + 7x^2 - 2x - 2$$

6. (14 pts). Perform the following operations and simplify.

$$(a). \frac{6}{x^2-9} \div \frac{3x+12}{x^2+7x+12} = \frac{6}{x^2-9} \cdot \frac{x^2+7x+12}{3x+12} = \frac{2}{\cancel{(x+3)}(x-3)} \cdot \frac{\cancel{(x+3)}\cancel{(x+4)}}{\cancel{3}(x+4)}$$

$$= \boxed{\frac{2}{x-3}}$$

$$(b). \frac{2}{a} - \frac{3a+4}{a^2+a} = \frac{2}{a} \cdot \frac{a+1}{a+1} - \frac{3a+4}{a(a+1)} \rightarrow \frac{2a+2-3a-4}{a(a+1)}$$

LCD: $a(a+1)$

$$= \frac{2(a+1)}{a(a+1)} - \frac{(3a+4)}{a(a+1)} = \frac{2(a+1)-(3a+4)}{a(a+1)} = \boxed{\frac{-a-2}{a(a+1)}}$$

7. (12 pts): Solve the following equations for x . [Check your answers.]

[If the solution is all real numbers or there is no solution, clearly state so.]

(a). $2x - 4(x+1) = 8 - 2x$

$$2x - 4x - 4 = 8 - 2x$$

$$\begin{array}{r} -2x - 4 = 8 - 2x \\ +2x \qquad \qquad +2x \\ \hline \end{array}$$

$$-4 = 8 \leftarrow \text{Not possible.}$$

$$\Rightarrow \boxed{\text{No Solution}}$$

(b). $\frac{2}{x} + \frac{3}{x+2} = 0$

Note: $x \neq 0, -2$

$$x(x+2) \cdot \left(\frac{2}{x} + \frac{3}{x+2} \right) = 0 \cdot x(x+2)$$

$$\text{LCD: } x(x+2) \left\{ \begin{array}{l} = \cancel{x(x+2)} \cdot \frac{2}{\cancel{x}} + \cancel{x(x+2)} \cdot \frac{3}{\cancel{x+2}} = 0 \end{array} \right. \rightarrow 5x = -4$$

$$(x+2) \cdot 2 + x \cdot 3 = 0$$

$$2x+4 + 3x = 0$$

$$5x+4 = 0$$

$$\boxed{x = -\frac{4}{5}}$$

8. (18 pts). [Leave answers for this problem in exact form (i.e., no decimal approximates) and simplify.]

(a). Solve by using the quadratic formula: $4x^2 - 12x = -6$

$$4x^2 - 12x + 6 = 0$$

$$x = \frac{12 \pm \sqrt{(-12)^2 - 4(4)(6)}}{2(4)}$$

$$= \frac{12 \pm \sqrt{48}}{8}$$

$$x = \frac{12 \pm \sqrt{16 \cdot 3}}{8}$$

$$x = \frac{12 \pm 4\sqrt{3}}{8}$$

$$x = \frac{4(3 \pm \sqrt{3})}{8}$$

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

(b). Solve by factoring: $5x^2 - 9x - 2 = 0$

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

$$5x+1=0 \quad x-2=0$$

$$5x = -1$$

$$x = 2$$

$$x = -\frac{1}{5}$$

(c). Solve by completing the square: $x^2 + 8x + 14 = 0$

$$x^2 + 8x = -14$$

$$x^2 + 8x + 16 = -14 + 16$$

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

$$x+4 = \pm\sqrt{2}$$

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

$$\frac{8}{2} = 4$$

$$4^2 = 16$$

↑
Add 16
to both
sides.

9. (6 pts). Write the standard form equation of a circle with center $(-1, 4)$ and a point on the circle is $(2, 5)$.
[Use exact values.]

radius equals the distance from the center to the point on the circle.

$$\text{ie } r = \sqrt{(2+1)^2 + (5-4)^2} = \sqrt{3^2 + 1^2} = \sqrt{9+1} = \sqrt{10}$$

$$(x+1)^2 + (y-4)^2 = (\sqrt{10})^2$$

$$(x+1)^2 + (y-4)^2 = 10$$

10. (6 pts). Your small business has a lawyer on retainer. You pay a monthly fee of \$420 for basic legal services. She charges an additional \$350 per hour for additional services. If your January bill is \$1032.50, complete the steps below to determine how many hours were billed for additional services.

- (a). Write the definition of x by filling in the following blank:

Let x be the number of hours billed for additional services.

- (b). Write down the mathematical model for the problem and solve it to find the number of hours billed for additional services.

$$420 + 350x = 1032.50$$

$$\begin{array}{r} -420 \qquad \qquad -420 \\ \hline \end{array}$$

$$350x = 612.50$$

$$x = \frac{612.50}{350} = 1.75 \text{ hours}$$

11. (10 pts). The height (in feet) of a falling object at time t (in seconds) is given by the position equation $s = -16t^2 + v_0t + s_0$, where v_0 is the initial velocity and s_0 is the initial height.

While riding the High Roller Ferris Wheel in Las Vegas, you accidentally drop your cell phone at the top. The High Roller Ferris Wheel is 550 feet tall*.

$$s_0 = 550$$

$$v_0 = 0$$

- (a). Write down the model for the height of the phone at time t using the correct values for the initial velocity v_0 and initial position s_0 .

$$s = -16t^2 + 550$$

- (b). What is the height of the cell phone after 2 seconds?

$$s = -16(2)^2 + 550$$

$$= 486 \text{ ft}$$

- (c). When will the cell phone hit the ground?

$$\hookrightarrow s = 0$$

$$0 = -16t^2 + 550$$

$$16t^2 = 550$$

$$t^2 = \frac{550}{16}$$

time is positive [Round answer to 2 decimal places.]

$$t = \sqrt{\frac{550}{16}}$$

$$t \approx 5.86 \text{ seconds}$$

