

Name Key (1 POINT) Total Possible Points = 200 Points

Note: Show all work. Unless a problem is marked with an asterisk (*), use a calculator only to check.

When asked for the equation of a line, the equation should be given in slope-intercept form.

1. Simplify: $\left(\frac{x^3 y^{-7} z^2}{x^{-5} y z^{-4}}\right)^3$ (Assume no variables are equal to zero.) (5 points)

(Must Show Procedure)

$$= \left(x^{3-(-5)} y^{-7-1} z^{2-(-4)}\right)^3$$

$$= \left(\frac{x^8 z^6}{y^8}\right)^3 = \frac{x^{24} z^{18}}{y^{24}}$$

2. Let $g(x) = -x^2 + 6x + 7$ and $f(x) = -4x + 7$ (9 points)

a. Find $f(4) = -4(4) + 7 = -16 + 7 = -9$

b. Find $g(-3) = -(-3)^2 + 6(-3) + 7 = -9 - 18 + 7 = -20$

c. Find x when $f(x) = 6$ $6 = -4x + 7 \Rightarrow -1 = -4x$

$x = \frac{1}{4}$

(10 points)

- *3. If $y = -x^3 + x + 5$ use your calculator

a) Find the x-intercept $(1.904, 0)$

b) Find the y-intercept $(0, 5)$

4. A car is rented for a day. It costs \$45 plus \$.37 per mile. (10 points)

a. Write a formula for a linear function f that calculates the cost of renting the car when the car is driven x miles. (Must Show Procedure)

$$C(x) = 0.37x + 45$$

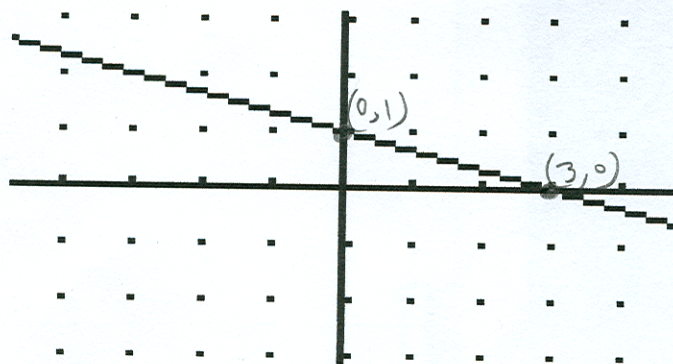
*b. How much does it cost to rent the car for a day and drive 137 miles.

$$C(137) = 0.37(137) + 45 = \$95.69$$

c) If it costs \$63.50 to rent this car for one day, how many miles was it driven?

$$63.50 = 0.37x + 45 \quad x = 50 \text{ miles}$$

5. Find the equation of the line shown below on the graph. (8 points)
(Must Show Procedure)



$$m = \frac{0-1}{3-0} = -\frac{1}{3} \quad \text{and } b=1$$

$$y = mx + b$$

$$y = -\frac{1}{3}x + 1$$

6. Find the equation of a line perpendicular to $y = -3x + 7$ and passing through $(4, -2)$ (Must Show Procedure) (7 points)

$$m = \frac{1}{3}$$

$$y = \frac{1}{3}x + b$$

$$-2 = \frac{1}{3}(4) + b \Rightarrow b = -\frac{10}{3}$$

$$y = \frac{1}{3}x - \frac{10}{3}$$

7. Solve the following system of equations using Elimination method.

$$-3 \begin{cases} 2x + y = 2 \\ 6x + 3y = 6 \end{cases}$$

$$\begin{cases} -6x - 3y = -6 \\ 6x + 3y = 6 \end{cases}$$

(10 points)

$$0 = 0$$

Many Solutions

8. A student takes out two loans to help pay for college. One loan is at 8% simple interest, and the other is at 9% simple interest. The total amount borrowed is \$4200, and the interest after 1 year for both loans is \$363. Find the amount of each loan.

(10 points)

$$\begin{cases} 0.08x + 0.09y = 363 \\ x + y = 4200 \end{cases}$$

$$\begin{cases} 8x + 9y = 36300 \\ -8x - 8y = -42000 \end{cases}$$

$$\begin{cases} 8x + 9y = 36300 \\ -8x - 8y = -42000 \end{cases}$$

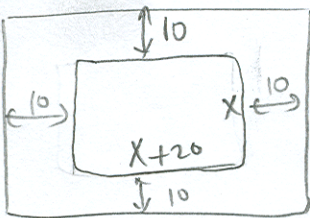
$$x + 2700 = 4200$$

$$x = 1500 \text{ at } 8\%$$

$$y = 2700 \text{ at } 9\%$$

9. A 10-foot wide sidewalk around a rectangular swimming pool has a total area of 2400 square feet. Find the dimensions of the swimming pool if the pool is 20 feet longer than it is wide.

(10 points)



$$(x+40)(x+20) - x(x+20) = 2400$$

$$x^2 + 60x + 800 - x^2 - 20x = 2400$$

$$40x + 800 = 2400$$

$$40x = 1600 \implies x = 40 \text{ feet}$$

$$x + 20 = 60 \text{ feet}$$

So, the Pool is 40' by 60'

$(2)(7) \times x$

$(7)(5) \times x \times x \times x \times x$

10. PERFORM THE OPERATION & SIMPLIFY:

(10 points)

$$a. \quad \frac{3}{14x^2} + \frac{4}{35x^7} = \frac{15x^5}{70x^7} + \frac{8}{70x^7}$$

$$= \frac{15x^5 + 8}{70x^7}$$

$$b. \quad \frac{4}{x^2 - 3x} - \frac{1}{x^2 - 5x + 6} = \frac{4}{x(x-3)} - \frac{1}{(x-3)(x-2)}$$

$$= \frac{4(x-2)}{x(x-2)(x-3)} - \frac{1(x)}{x(x-3)(x-2)} = \frac{4x-8-x}{x(x-2)(x-3)} = \frac{3x-8}{x(x-2)(x-3)}$$

11. SOLVE FOR X:

$$\frac{x}{x+2} + \frac{7}{x-6} = \frac{14}{x^2 - 4x - 12}$$

(10 points)

LCD = (x+2)(x-6)

$$\frac{\cancel{(x+2)}(x-6)x}{\cancel{(x+2)}} + \frac{\cancel{(x+2)}(x-6)7}{\cancel{(x-6)}} = \frac{\cancel{(x+2)}(x-6)14}{\cancel{(x-6)}(x+2)}$$

↑ correction

$$x^2 - 6x + 7x + 14 = 14$$

$$x^2 + x = 0$$

$$x(x+1) = 0$$

$$x = 0 \quad x = -1$$

12. SOLVE FOR X: Check for extraneous solutions.

(10 points)

$$\frac{2}{x-5} - \frac{1}{x+1} = \frac{5}{x+1}$$

LCD = (x+1)(x-5)

$$\frac{\cancel{(x+1)}(x-5)2}{\cancel{(x-5)}} - \frac{\cancel{(x+1)}(x-5)1}{\cancel{(x+1)}} = \frac{\cancel{(x+1)}(x-5)5}{\cancel{(x+1)}}$$

$$2x+2 - x+5 = 5x-25$$

$$\rightarrow -4x = -32$$

$$x+7 = 5x-25$$

$$x = 8$$

13. Suppose you want to drive from Miami, Florida to Atlanta, Georgia. The speed limit is 70 mph in Florida and 65 mph in Georgia. The trip involves 473 miles of travel in Florida and 253 miles of travel in Georgia. Assume that you drive nonstop.

(4 Points Each)

- a. How long will the trip take if you drive at the speed limit for the whole trip?

Note:

$$\text{time} = \frac{\text{Distance}}{\text{speed}}$$

$$\text{time} = \frac{473}{70} + \frac{253}{65} = 10.65 \text{ HRS}$$

- b. Suppose you plan to drive above the speed limit. Let your speed be represented by $70 + x$ in Florida and $65 + x$ in Georgia, where x is the number of miles per hour over the speed limit you are willing to drive. Write the function $T(x)$.

$$T(x) = \frac{473}{70+x} + \frac{253}{65+x}$$

- c. Find $T(0)$. Compare to part 1.

$$T(0) = \frac{473}{70+0} + \frac{253}{65+0} = 10.65 \text{ HRS}$$

- d. Find $T(10)$. Interpret this answer.

$$T(10) = \frac{473}{70+10} + \frac{253}{65+10} = 9.29 \text{ HRS}$$

- e. Find $T(10) - T(0)$. Interpret the meaning in terms of driving from Miami to Atlanta.

$$9.29 \text{ HRS} - 10.65 \text{ HRS} = -1.36$$

If you drive over speed limit (by 10 mph), the travel time is reduced by 1.36 HRS

14. CONVERSIONS FROM EXPONENTIAL FORM TO RADICAL FORM AND VICE VERSA:

Recall: $a^{m/n} = (a^{1/n})^m = \sqrt[n]{a^m}$

SIMPLIFYING RADICAL EXPRESSIONS:

To simplify radical expressions, use the product property for radicals

$$\sqrt{ab} = \sqrt{a} \sqrt{b}$$

Simplify the following:

(20 points)

A. $\sqrt{200}$

$$\begin{aligned} &= \sqrt{100} \sqrt{2} \\ &= 10\sqrt{2} \end{aligned}$$

C. $\sqrt{32x^9}$

$$\begin{aligned} &= \sqrt{2} \sqrt{16} \sqrt{x^8} \sqrt{x} \\ &= 4x^4 \sqrt{2x} \end{aligned}$$

E. $\sqrt{(3x+5)^{18}}$

$$(3x+5)^{\frac{18}{2}} = (3x+5)^9$$

B. $\sqrt{40x^{14}}$

$$\begin{aligned} &\sqrt{4} \sqrt{10} \sqrt{x^{14}} \\ &= 2x^7 \sqrt{10} \end{aligned}$$

D. $\sqrt{(x+7)^{15}}$

$$\begin{aligned} &= \sqrt{(x+7)^{14}} \sqrt{(x+7)} \\ &= (x+7)^7 \sqrt{(x+7)} \end{aligned}$$

F. $\sqrt{27x^8y^5}$

$$\begin{aligned} &= \sqrt{9} \sqrt{3} \sqrt{x^8} \sqrt{y^4} \sqrt{y} \\ &= 3x^4y^2 \sqrt{3y} \end{aligned}$$

15. State the domain of the following functions.
Write your answer in set-builder notation:

(10 points)

a) $h(x) = \frac{1}{3x-9}$

$$\{x \mid x \neq 3\}$$

b) $f(x) = \frac{1}{x-2}$

$$\{x \mid x \neq 2\}$$

c) $g(x) = \frac{1}{x^2-4}$

$$\{x \mid x \neq -2, x \neq 2\}$$

d) $f(x) = x^2 - 3x + 2$

$$\{x \mid x \text{ is all Reals}\}$$

16. Solve the following rational equations

(10 points)

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

$$\frac{\cancel{x} \cdot \cancel{(x-1)} \cdot 5x}{\cancel{(x-1)}} = \frac{\cancel{(x-1)} \cdot (2x+1)}{\cancel{(x-1)}}$$

$$\begin{array}{r} 5x = 2x + 1 \\ -2x \quad -2x \\ \hline 3x = 1 \end{array}$$

$$3x = 1$$

$$x = \frac{1}{3}$$

b) $3x = \frac{6}{2x+1}$

$$\cancel{(2x+1)} \cdot 3x = \frac{6}{\cancel{(2x+1)}} \cdot \cancel{(2x+1)}$$

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

$$6x^2 + 3x - 6 = 0$$

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

$$x \approx 0.78 \quad x \approx -1.28$$

17. Perform the operation and Simplify the following expressions:

(7.5 Points Each)

$$a) \frac{x^2 + 3x + 2}{4x + 2} \div \frac{2x + 4}{x + 1}$$

$$= \frac{\cancel{(x+2)}(x+1)}{2(2x+1)} \cdot \frac{x+1}{2\cancel{(x+2)}}$$

$$= \frac{(x+1)^2}{4(2x+1)}$$

$$b) \frac{b+1}{b^2-1} \cdot \frac{b-1}{b^2+1}$$

$$= \frac{\cancel{b+1}}{\cancel{(b-1)}(b+1)} \cdot \frac{\cancel{b-1}}{(b^2+1)}$$

$$= \frac{1}{(b^2+1)}$$

18. Perform the operation and Simplify the following expression expressions:

(7.5 Points Each)

$$a) \frac{x}{2x+1} + \frac{1-x}{5x}$$

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

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

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

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

$$b) \frac{2x}{x-4} - \frac{x}{x+4}$$

$$= \frac{2x(x+4) - x(x-4)}{(x-4)(x+4)}$$

$$= \frac{2x^2 + 8x - x^2 + 4x}{(x-4)(x+4)}$$

$$= \frac{x^2 + 12x}{(x-4)(x+4)}$$

$$= \frac{x(x+12)}{(x-4)(x+4)}$$

Name _____ (1 POINT)

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Note: Show all work. Unless a problem is marked with an asterisk (*), use a calculator only to check.

When asked for the equation of a line, the equation should be given in slope-intercept form.

1. Simplify: $\frac{16x^{-3}y^8z^2}{6xy^{-5}}$ (Assume no variables are equal to zero.)

(5 points)

(Must Show Procedure)

$$\frac{8y^{13}z^2}{3x^4}$$

2. Find the equation of a line passing through (9, -3) and (4, -8)
(Must Show Procedure)

(9 points)

$$m = \frac{-8 - (-3)}{4 - 9} = \frac{-5}{-5} = 1$$

$$y = mx + b$$

$$-3 = 1(9) + b \Rightarrow b = -12$$

$$y = 1x - 12$$

- *3. If $y = -x^3 + x + 5$ use your calculator

(10 points)

- a) Find the x-intercept

$$(1.904, 0)$$

- b) Find the y-intercept

$$(0, 5)$$

4. The monthly fees for a condo association can be modeled by the following formula:

$$f(x) = 52x + 100$$

where x is the number of years since the condo association was built in 1999.

(Must Show Procedure)

(10 points)

*a. What were the monthly fees in 2002?

$$x = 2002 - 1999 = 3$$

$$f(3) = \$256$$

b. Determine the year when the monthly fees were \$412?

$$412 = 52x + 100 \Rightarrow x = 6 ; \text{ year } 1999 + 6 = 2005$$

c. Interpret the slope as a rate of change.

Every year the \wedge Condo fee increases by \$52 per month
monthly

5. Translate the following sentence into an equation and then solve the equation for x .

"If 2 is subtracted from 5 times x , it equals x plus 4"

(Must Show Procedure)

(8 points)

$$\begin{array}{r} 5x - 2 = x + 4 \\ -x \quad \quad -x \\ \hline 4x - 2 = 4 \end{array}$$

$$4x = 6 \Rightarrow x = \frac{6}{4} = 1.5$$

6. Find the equation of a line parallel to $-2x - 5y = 10$ and passing through $(4, -2)$

(Must Show Procedure)

(7 points)

$$-5y = 2x + 10$$

$$y = \frac{2}{5}x + \frac{10}{-5}$$

$$m = -\frac{2}{5}$$

$$y = mx + b$$

$$-2 = -\frac{2}{5}(4) + b \Rightarrow b = -\frac{2}{5}$$

$$y = -\frac{2}{5}x - \frac{2}{5}$$