

Name: Jasmine Jackson

Perm: 4659892

Math 34A Midterm 1, Summer 2022



1. (2pts) Solve the system of equations below for  $x$  and  $y$ . Your answers should be in terms of  $a$  and  $b$ .

$$2x + 3y = a$$

$$x + y = b$$

$$x = b - y$$

$$2(b - y) + 3y = a$$

$$2b - 2y + 3y = a$$

$$x + (a - 2b) = b$$

$$x = b - (a - 2b)$$

$$x = b - a + 2b$$

$$\boxed{x = 3b - a}$$

$$2b + y = a$$

$$\boxed{y = a - 2b}$$

$$\begin{array}{r} \frac{2(a^4 b^4)}{a^1 b^1 (b^{-4} x^4 y^{-8})} \\ \times y \\ \hline 2a^{-4} 2b^4 \\ (a^1 b^{-4}) \end{array}$$

$$x = \boxed{3b - a}$$

$$y = \boxed{a - 2b}$$

2. (2pts) Multiply out and simplify. Your answer should have no negative exponents in it.

$$\left(\frac{a^{-1}b}{xy}\right)^{-2} \cdot \left(\frac{a^{-1}b}{\sqrt[4]{b^{-4}x^4y^{-8}}}\right)^4 = \frac{bb}{2a} \cdot \frac{5}{3}$$

$$\frac{2 \cdot (a^{-1}b)}{a^{-1}b \cdot (b^{-1}x^{-2})}$$

$$= \boxed{\frac{6by}{6a}}$$

$$= \frac{2a^{-1}2b}{a^{-1}b^{-1}b^{-1}x^{-2}} = \frac{2a^{-1}2b}{a^{-1}y^{-3}} = \frac{\frac{1}{2}a^{-3}2b}{y^{-3}} = \frac{\frac{3}{2}a \cdot 2b}{y^3} = \frac{6b}{2a} \div \frac{3}{y}$$

$$\cancel{\left(\frac{a^{-1}b}{xy}\right)^{-2} \cdot \frac{(a^{-1}b)^4}{b^{-4}x^4y^{-8}}}$$

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

$$\boxed{\frac{6by}{6a}}$$

3. (2pts) Substitute  $x = a + b$  into the expression below and simplify completely. There should be no parentheses in your answer.

$$x(a^4 - a^3b + a^2b^2 - ab^3 + b^4)(x - 2b) \quad x = a+b$$

$$\begin{aligned} & (a+b)(a^4 - a^3b + a^2b^2 - ab^3 + b^4) \cdot ((a+b) - 2b) \\ & a^5 - a^4b + a^3b^2 - a^2b^3 + ab^4 + (-a - b - 2b) \\ & a^5b - a^4b^2 + a^3b^3 - a^2b^4 + ab^5 - a - 3b \\ & (a^5 + b^5)(-a - 3b) \\ & -a^6 - 3ba^5 - ab^5 - 3b^6 \end{aligned}$$

$$-a^6 - 3ba^5 - ab^5 - 3b^6$$

4. (4pts) Your classmate Eve has been studying for the 34A midterm so hard that they forgot to eat dinner. You want to make them a pizza as quickly as possible, and you set the oven to preheat to  $450^\circ$ . You notice that at exactly 8:13PM, the oven's temperature is  $90^\circ$ . You check back at exactly 8:17PM and the oven's temperature is now  $330^\circ$ . Using linear extrapolation, at what time do you estimate will the oven will be preheated to  $450^\circ$ ?

Preheat  $450^\circ$

$$8:13\text{pm} \rightarrow 90^\circ \quad (3, 90) \quad \frac{330-90}{7-3} = \frac{240}{4} = 60 = m$$

$$8:17\text{pm} \rightarrow 330^\circ \quad (7, 330)$$

$$\begin{aligned} 90 &= 60(3) + b \\ 90 &= 180 + b \\ -60 &= b \end{aligned}$$

$$\begin{array}{r} 60 \\ \times 13 \\ \hline 180 \\ 600 \\ \hline 780 \\ - 40 \\ \hline 690 \end{array}$$

(3, -10)

(7, 230)

$$\frac{230+10}{7-3} = \frac{240}{4} = 60$$

$$\begin{aligned} 450 &= 60(x) - 690 \\ +690 & \\ 1140 &= 60x \end{aligned}$$

$$\begin{array}{r} 1140 \\ \times 60 \\ \hline 2.3 \\ 60 \\ \hline 1140.0 \\ \times 2 \\ \hline 200 = x \end{array}$$

$$90 = 60(3) + b$$

$$90 = 180 + b$$

$$-90 = b$$

$$450 = 60(x) - 90$$

$$+90$$

$$540 = 60x$$

$$\begin{array}{r} 540 \\ \times 60 \\ \hline 9.0 \\ 540 \\ \hline 9 = x \end{array}$$

$$\begin{array}{r} 560 \\ \times 10 \\ \hline 56 \\ 9.5 \\ \hline 56.0 \\ \times 10 \\ \hline 560 \\ \times 10 \\ \hline 560 \end{array}$$

$$\begin{array}{r} 560 \\ \times 10 \\ \hline 56 \\ 9.5 \\ \hline 56.0 \\ \times 10 \\ \hline 560 \\ \times 10 \\ \hline 560 \end{array}$$

$$\begin{array}{r} 560 \\ \times 10 \\ \hline 56 \\ 9.5 \\ \hline 56.0 \\ \times 10 \\ \hline 560 \\ \times 10 \\ \hline 560 \end{array}$$

about 8:19pm

5. (4pts) A city planner wants to build a park with a playground surrounded by a field, and to keep the kids safe she wants to build a fence around it. The field is to be four times as wide as it is long. Fencing purchases are \$350 for shipping plus \$33 per foot of fencing. Express the cost of fencing for the perimeter in terms of the length of the field. Simplify your answer.

$$P(x) = ?$$

$$w = 4x$$



$$\text{Fencing} = \$350 + \$33/\text{ft}$$

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

$$A = lw$$

$$P(x) = 10x$$

$$P = 2x + 2w$$

$$\text{Cost } P(x) = 350 + 10(33x)$$

$$\boxed{\text{Cost } P(x) = 330x + 350}$$

Fencing Cost = \$

$$\boxed{330x + 350}$$

6. (5 points) You are considering the purchase of a 55in TV (TV sizes are measured by the diagonal, not the length or width). You know that the aspect ratio of a screen is the ratio of the width to the height. However, the manufacturer will only disclose the height of the TV, not the width. Express the aspect ratio in terms of the height  $h$  of the TV.

$$w:h$$



$$a^2 = h^2 + w^2$$

$$55^2 = h^2 + w^2$$

$$55^2 - h^2 = w^2$$

$$\sqrt{55^2 - h^2} = w$$

Aspect Ratio =

$$\sqrt{55^2 - h^2}$$

7. (3 points) What are the following limits?

(a)  $\lim_{x \rightarrow 6} 10x - 5$

-5

(b)  $\lim_{x \rightarrow \infty} \frac{14x+4}{16x+3}$

approaching  $\frac{4}{3}$   
 $\frac{14,000,004}{16,000,003} \quad \frac{4}{3} = 1.33$   
approaching 2

-2

(c)  $\lim_{x \rightarrow \infty} \frac{10x^2+x}{-7x}$

$\frac{x(10x+1)}{-7x}$

1

8. (3 points) Compute the logarithms below.

(a)  $\log_2(8)$

4

(b)  $\log_{10}(.01)$

$\log(.01) = \log(10) + \log(10^{-3})$   
 $= -3$   
 $= -2$

-2

(c)  $\log_5(125)$

$5 \cdot 5 = 25 \cdot 5 = 125$

3