Instructor:	Frank Secretain
Course:	Math 1004
Date:	November 25, 2025
Assessment:	Test 3a
Time allowed:	110 minutes
Devices allowed:	Pencil, pen, eraser, calculator
Notes from instructor:	Be neat. Show your work where needed. Box final answers.
Marks allocated:	3 questions worth 20 marks
Percentage of final grade:	20% of final grade

Formula Sheet

Order of Operations

$$ac + bc = c(a + b)$$

exponents

$$a^n a^m = a^{n+m}$$

$$(a^n)^m = a^{nm}$$

$$(ab)^n = a^n b^n$$

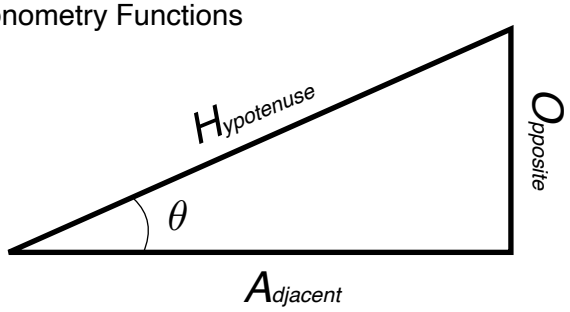
$$a^0 = 1$$

$$a^{-n} = \frac{1}{a^n}$$

radicals

$$a^{\frac{n}{m}} = \sqrt[m]{a^n}$$

Trigonometry Functions



$$sin(\theta) = \frac{O}{H} \qquad sin^{-1}\left(\frac{O}{H}\right) = \theta$$

$$cos(\theta) = \frac{A}{H} \qquad cos^{-1}\left(\frac{A}{H}\right) = \theta$$

$$tan(\theta) = \frac{O}{A} \qquad tan^{-1}\left(\frac{O}{A}\right) = \theta$$

Pythagoras Theorem

$$H^2 = O^2 + A^2$$

Relative Velocity

$$\vec{v}_{\frac{A}{C}} = \vec{v}_{\frac{A}{B}} + \vec{v}_{\frac{B}{C}}$$

$$\vec{v}_{\frac{B}{A}} = -\vec{v}_{\frac{A}{B}}$$

Linear equations (Cramer's rule)

$$x_i = \frac{det(A_i)}{det(A)}$$

Forms of a 1st order polynomial

$$y = ax + b$$

Forms of a 2nd order polynomial

$$y = ax^2 + bx + c$$

$$y = a(x - h)^2 + k$$

$$y = a(x - m)(x - n)$$

Quadratic Equation

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Unit Conversions

angles

$$2\pi = 6.28 \text{ rad} = 360^o$$

mass

$$1 \text{ kg} = 2.2 \text{ lbs.}$$

lengths

$$1 \text{ mile} = 1.6 \text{ km}$$

$$1 \text{ inch} = 2.54 \text{ cm}$$

$$1 \text{ m} = 3.3 \text{ ft}$$

volumes

$$1 \text{ gallon} = 3.78 \text{ Litres}$$

.(3 marks each) Solve for x in the following equations.

$$3b(3ax - b) + \frac{4x}{3} = 2$$

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

$$1 + \frac{\cos(3 - x^2) + a^2}{b - 1} - \alpha^2 = 0$$

$$\frac{x - 1}{x + 1} + a^2 = \sin(2\phi^3)$$

(4 marks) Solve for x and y in the following equations.

$$\frac{3x - y + 2}{x - 1} + 3 = 2$$

$$1 - \frac{y}{x - 1} + 1 = 0$$

(4 marks) A textbook has a total of 1382 pages which is broken into two parts. The second part of the book has 64 more pages than the first part. How many pages are in each part of the book.

.(3 marks each) Solve for x in the following equations.

$$3b(3ax - b) + \frac{4x}{3} = 2$$

$9abx - 3b^2 + \frac{4x}{3} = 2$

$9abx + \frac{4x}{3} = 2 + 3b^2$

$x\left(9ab + \frac{4}{3}\right) = 2 + 3b^2$

$$x = \frac{2 + 3b^2}{9ab + \frac{4}{3}}$$

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

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

$2x - 5 + 2x^2 + 2x = x + 1$

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

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$x = 1.137, -2.637$

$$1+\frac{\cos(3-x^2)+a^2}{b-1}-\alpha^2=0$$

$$\frac{\cos(3-x^2)+a^2}{b-1}=\alpha^2-1$$

$$\cos(3-x^2)+a^2=(\alpha^2-1)(b-1)$$

$$3-x^2=\cos^{-1}\left((\alpha^2-1)(b-1)-a^2\right)$$

$$\boxed{x=\sqrt{3-\cos^{-1}\left((\alpha^2-1)(b-1)-a^2\right)}}$$

$$\frac{x-1}{x+1}+a^2=\sin(2\phi^3)$$

$$x-1+a^2(x+1)=\sin(2\phi^3)(x+1)$$

$$x-1+a^2x+a^2=x\sin(2\phi^3)+\sin(2\phi^3)$$

$$x+a^2x-x\sin(2\phi^3)=1-a^2+\sin(2\phi^3)$$

$$x\left(1+a^2-\sin(2\phi^3)\right)=1-a^2+\sin(2\phi^3)$$

$$\boxed{x=\frac{1-a^2+\sin(2\phi^3)}{1+a^2-\sin(2\phi^3)}}$$

(4 marks) Solve for x and y in the following equations.

$$\frac{3x-y+2}{x-1}+3=2 \qquad (1)$$

$$1-\frac{y}{x-1}+1=0 \qquad (2)$$

Simplify (1):

$3x-y+2+3(x-1)=2(x-1)$

$3x-y+2+3x-3=2x-2$

$4x-y=-1 \qquad (1a)$

Simplify (2):

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

$x-1-y+x-1=0$

$2x-y=2 \qquad (2a)$

Solve for y in (1a):

$y=4x+1 \qquad (1b)$

sub. (1b) into (2a):

$2x-[4x+1]=2$

$2x-4x-1=2$

$-2x=3$

$\boxed{x=-\frac{3}{2}=-1.5} \qquad (2b)$

sub (2b) into (1b)

$y=4\left[-\frac{3}{2}\right]+1$

$=-6+1$

$\boxed{y=-5}$

(4 marks) A textbook has a total of 1382 pages which is broken into two parts. The second part of the book has 64 more pages than the first part. How many pages are in each part of the book.

let:

X_1 = # of pages in 1st part of book

X_2 = # of pages in 2nd part of book.

so

$$X_1 + X_2 = 1382 \qquad (1)$$

$$X_1 + 64 = X_2 \qquad (2)$$

sub (2) into (1):

$$X_1 + [X_1 + 64] = 1382$$

$$2X_1 + 64 = 1382$$

$$2X_1 = 1318$$

$$\boxed{X_1 = 659} \qquad (1a)$$

sub (1a) into (2)

$$X_2 = [659] + 64$$

$$\boxed{X_2 = 723}$$

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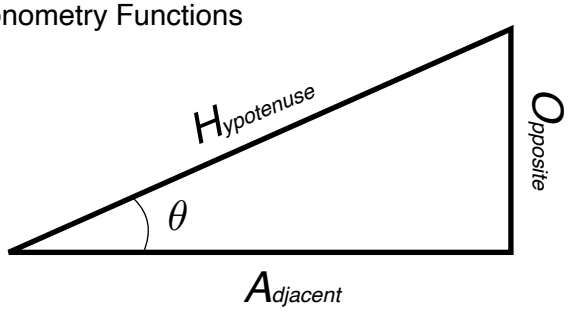

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volumes

$$1 \text{ gallon} = 3.78 \text{ Litres}$$

.(3 marks each) Solve for x in the following equations.

$$3b(2ax - b) + \frac{7x}{3} = 3$$

$$\frac{2x - 4}{x + 2} + x = -1$$

$$2 + \frac{\sin(3 - x^2) + b^2}{b - 1} - \beta^2 = 0$$

$$\frac{x + 1}{x - 1} + b^2 = \cos(2\phi^3)$$

(4 marks) Solve for x and y in the following equations.

$$\frac{x-3y+2}{x-1}+3=2$$

$$1-\frac{y}{x-1}+1=0$$

(4 marks) Person A and person B can lift 9240 pounds combined at the gym. Person A can lift 287.3 more pounds than what person B can lift. How much can each person lift?

.(3 marks each) Solve for x in the following equations.

$$3b(2ax - b) + \frac{7x}{3} = 3$$

$6abx - 3b^2 + \frac{7x}{3} = 3$

$6abx + \frac{7x}{3} = 3 + 3b^2$

$x\left(6ab + \frac{7}{3}\right) = 3 + 3b^2$

$$x = \frac{3 + 3b^2}{6ab + \frac{7}{3}}$$

$$\frac{2x - 4}{x + 2} + x = -1$$

$2x - 4 + x(x+2) = -1(x+2)$

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

$x^2 + 5x - 2 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$x = 0.372, -5.372$

$$2 + \frac{\sin(3 - x^2) + b^2}{b - 1} - \beta^2 = 0$$

$$\frac{\sin(3-x^2)+b^2}{b-1} = \beta^2 - 2$$

$$\sin(3-x^2)+b^2 = (\beta^2-2)(b-1)$$

$$3-x^2 = \sin^{-1}\left((\beta^2-2)(b-1)-b^2\right)$$

$$\boxed{x = \sqrt{3 - \sin^{-1}\left((\beta^2-2)(b-1)-b^2\right)}}$$

$$\frac{x+1}{x-1} + b^2 = \cos(2\phi^3)$$

$$x+1 + b^2(x-1) = \cos(2\phi^3)(x-1)$$

$$x+1 + b^2x - b^2 = x\cos(2\phi^3) - \cos(2\phi^3)$$

$$x + b^2x - x\cos(2\phi^3) = -1 + b^2 - \cos(2\phi^3)$$

$$x\left(1 + b^2 - \cos(2\phi^3)\right) = -1 + b^2 - \cos(2\phi^3)$$

$$\boxed{x = \frac{b^2 - 1 - \cos(2\phi^3)}{b^2 + 1 - \cos(2\phi^3)}}$$

(4 marks) Solve for x and y in the following equations.

$$\frac{x-3y+2}{x-1}+3=2 \qquad (1)$$

$$1-\frac{y}{x-1}+1=0 \qquad (2)$$

Simplify (1):

$x-3y+2+3(x-1)=2(x-1)$

$x-3y+2+3x-3=2x-2$

$2x-3y=-1 \qquad (1a)$

Simplify (2):

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

$x-1-y+x-1=0$

$2x-y=2 \qquad (2a)$

Solve for y in (2a):

$y=2x-2 \qquad (2b)$

sub (2b) into (1a)

$2x-3[2x-2]=-1$

$2x-6x+6=-1$

$-4x=-7$

$x=\frac{7}{4}=1.75 \qquad (1b)$

sub (1b) into (2b)

$y=2\left[\frac{7}{4}\right]-2$

$=\frac{7}{2}-2$

$y=\frac{3}{2}=1.5$

(4 marks) Person A and person B can lift 9240 pounds combined at the gym. Person A can lift 287.3 more pounds than what person B can lift. How much can each person lift?

let

A = the amount person A can lift [pounds]

B = the amount person B can lift [pounds]

so

$$A + B = 9240 \quad (1)$$

$$B + 287.3 = A \quad (2)$$

sub (2) into (1)

$$[B + 287.3] + B = 9240$$

$$2B + 287.3 = 9240$$

$$2B = 8952.7$$

$$\boxed{B = 4476.35} \quad (1a)$$

sub (1a) into (2)

$$A = [4476.35] + 287.3$$

$$\boxed{A = 4763.65}$$