Instructor:	Frank Secretain
Course:	Math 101
Assessment:	Test 1
Time allowed:	110 minutes
Devices allowed:	Pencil, pen, eraser, calculator
Marks allocated:	7 questions worth 25 marks + 1 bonus worth 1 mark
Percentage of final grade:	15% of final grade
Notes from instructor:	Be neat. Show your work where needed. Box final answers. Print your test and write answers in the space provided. If you can't print, then use blank paper and copy the question number as it is written on the test and answer in the space provided as if the test was printed.
Questions:	Give me a call on teams.
Submission:	At the end of your test: scan or take pictures of your test pages in order. Compile email and send it to: **math101@franksecretain.ca** **by 2:30 pm on October 15, 2020**

Formula Sheet

Order of Operations

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

exponents

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

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

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

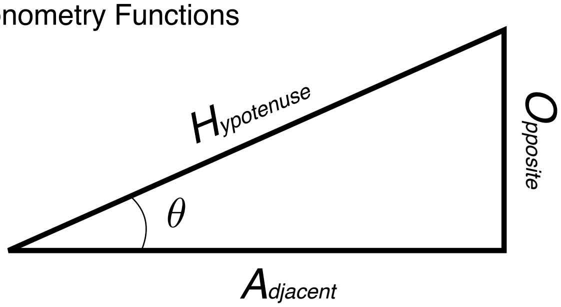
$$a^0 = 1$$

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

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

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

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

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

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) Match the "type of number" with the best "example number". Draw a line to match the "type of number" to the "example number" to indicate your answer.

natural	0
integer	1
rational	0.25

(2 marks) Solve the each expression and keep the correct number of significant digits.

47.1 + (0.020)(1020)

(12.340)/(0.012)+1.400

(1 marks) Convert into scientific notation.

1200

let:

$$15.6\tau = \Lambda \qquad 4.6\gamma = 3.1\beta$$

$$0.087\epsilon = 2.3\Lambda \qquad 3.1\theta = 2.1\Phi$$

(6 marks) Convert each of the numbers to the stated units.

$$4.23\frac{\gamma}{\theta} \rightarrow \frac{\beta}{\Phi}$$

$$120\frac{\tau}{\Phi} \rightarrow \frac{\epsilon}{m\theta}$$

$$46.3\frac{\epsilon^2}{\gamma} \rightarrow \frac{\Lambda^2}{k\beta}$$

(5 marks) You are dropped off at an unknown location but told if you run 300 m South, 100 m West, 200 m at 25^0 West of North and 400 m at 75^0 South of East you will get home. How far were you dropped off from your home?

3

(2 marks each) Solve for x in the following equations

$$\beta + 7 = x + \left(\frac{2c}{d}\right)^a$$

$$\alpha - x = \sin(\theta) + \frac{3d - u}{\epsilon^n}$$

(2 marks each) Solve for u in the following equations

$$\frac{3t}{u} = \frac{4}{\beta}$$

$$\frac{e}{3-y} = \frac{u}{\sin(\theta) + th}$$

(1 mark) Bonus:

Using the conversions on page 2, convert the number to the stated unit.

$$42\frac{\tau^2}{m\beta} \rightarrow \frac{k\Lambda^2}{10\gamma}$$

(3 marks) Match the "type of number" with the best "example number". Draw a line to match the "type of number" to the "example number" to indicate your answer.

natural	0
integer	1
rational	0.25

(2 marks) Solve the each expression and keep the correct number of significant digits.

$= 47.1 + (0.020)(1020)$

$= 47.1 + 20.4$

$= 67.5$

$= 68$

$= (12.340)/(0.012) + 1.400$

$= 1028.333 + 1.400$

$= 1029.733$

$= 1.0 \times 10^3$

(1 marks) Convert into scientific notation.

1200

$= 1.2 \times 10^3$

let:

$$15.6\tau = \Lambda \qquad 4.6\gamma = 3.1\beta$$

$$0.087\epsilon = 2.3\Lambda \qquad 3.1\theta = 2.1\Phi$$

(6 marks) Convert each of the numbers to the stated units.

$$4.23\frac{\gamma}{\theta} \rightarrow \frac{\beta}{\Phi}$$

$$4.23\frac{\gamma}{\theta}\left(\frac{3.1\beta}{4.6\gamma}\right)\left(\frac{3.1\theta}{2.1\Phi}\right) = 4.21\frac{\beta}{\Phi}$$

$$120\frac{\tau}{\Phi} \rightarrow \frac{\epsilon}{m\theta}$$

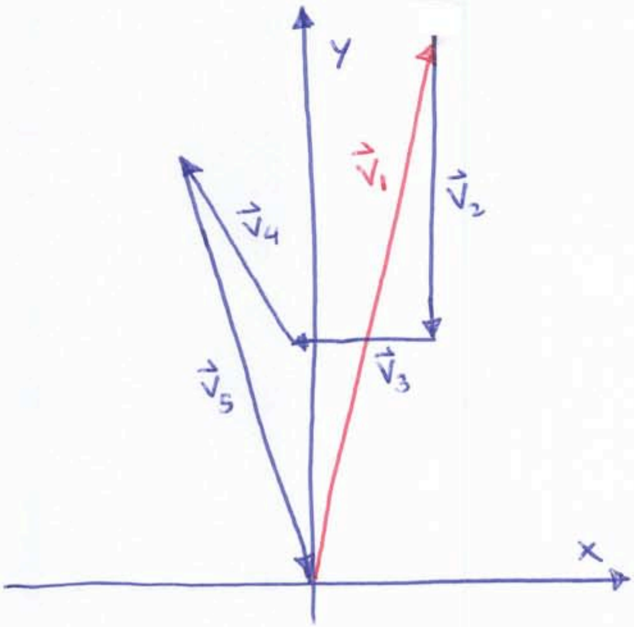
$$120\frac{\tau}{\Phi}\left(\frac{1\Lambda}{15.6\tau}\right)\left(\frac{0.087\epsilon}{2.3\Lambda}\right)\left(\frac{2.1\Phi}{3.1\theta}\right)\left(\frac{1\theta}{1000m\theta}\right) = 0.000197\frac{\epsilon}{m\theta}$$

$$46.3\frac{\epsilon^2}{\gamma} \rightarrow \frac{\Lambda^2}{k\beta}$$

$$46.3\frac{\epsilon^2}{\gamma}\left(\frac{2.3\Lambda}{0.087\epsilon}\right)^2\left(\frac{4.6\gamma}{3.1\beta}\right)\left(\frac{1000\beta}{1k\beta}\right) = 48020000\frac{\Lambda^2}{k\beta}$$

2

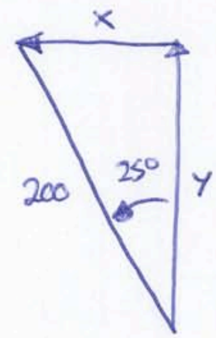
(5 marks) You are dropped off at an unknown location but told if you run 300 m South, 100 m West, 200 m at 25º West of North and 400 m at 75º South of East you will get home. How far were you dropped off from your home?



$$\vec{V}_1 + \vec{V}_2 + \vec{V}_3 + \vec{V}_4 + \vec{V}_5 = \vec{V}_f = 0$$

so

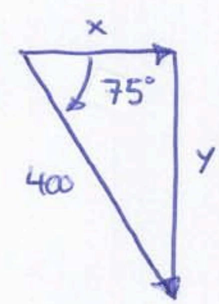
$$\boxed{\vec{V}_1 = -\vec{V}_2 - \vec{V}_3 - \vec{V}_4 - \vec{V}_5}$$



$$-\vec{V}_2 = 0\,\hat{x} + 300\,\hat{y}$$
$$-\vec{V}_3 = 100\,\hat{x} + 0\,\hat{y}$$
$$-\vec{V}_4 = 84.52\,\hat{x} - 181.26\,\hat{y}$$
$$-\vec{V}_5 = -103.52\,\hat{x} + 386.37\,\hat{y}$$
$$\vec{V}_1 = 81\,\hat{x} + 505.11\,\hat{y}$$

$x = 200 \sin(25) = 84.52$

$y = 200 \cos(25) = 181.26$



$$|\vec{V}_1| = \sqrt{(81)^2 + (505.11)^2}$$

$$\boxed{|\vec{V}_1| = 512 \text{ m}}$$

$x = 400 \cos(75) = 103.52$

$y = 400 \sin(75) = 386.37$

3

(2 marks each) Solve for x in the following equations

$$\beta + 7 = x + \left(\frac{2c}{d}\right)^a$$

$$\beta + 7 - \left(\frac{2c}{d}\right)^a = x$$

$$\boxed{x = \beta + 7 - \left(\frac{2c}{d}\right)^a}$$

$$\alpha - x = \sin(\theta) + \frac{3d - u}{\epsilon^n}$$

$$\alpha = \sin\theta + \frac{3d-u}{\epsilon^n} + x$$

$$\alpha - \sin\theta - \frac{3d-u}{\epsilon^n} = x$$

$$\boxed{x = \alpha - \sin\theta - \frac{3d-u}{\epsilon^n}}$$

(2 marks each) Solve for u in the following equations

$$\frac{3t}{u} = \frac{4}{\beta}$$

$$3t = \frac{4u}{\beta}$$

$$\frac{3t\beta}{4} = u$$

$$u = \frac{3t\beta}{4}$$

$$\frac{e}{3-y} = \frac{u}{\sin(\theta) + th}$$

$$\frac{(e)(\sin\theta + th)}{3-y} = u$$

$$u = \frac{(e)(\sin\theta + th)}{3-y}$$

(1 mark) Bonus:

Using the conversions on page 2, convert the number to the stated unit.

$$42 \frac{\tau^2}{m\beta} \rightarrow \frac{k\Lambda^2}{10\gamma}$$

$$42 \frac{\tau^2}{m\beta}\left(\frac{1000\ m\beta}{\beta}\right)\left(\frac{3.1\ \beta}{4.6\ \gamma}\right)\left(\frac{10\ \gamma}{10\ \gamma}\right)\left(\frac{1\ \Lambda}{15.6\ \tau}\right)^2\left(\frac{1\ k\Lambda}{1000\ \Lambda}\right)^2$$

$$0.00116\ \frac{k\Lambda^2}{10\gamma}$$