

Instructor: Frank Secretain  
Course: Math 101

Assessment: Test 2  
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: 2 questions worth 20 marks + 1 bonus question worth 2 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

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

### Relative Velocity

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

### Linear equations (Cramer's rule)

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

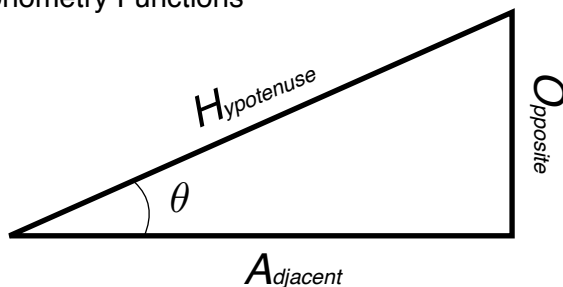
### Forms of a 2nd order polynomial

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

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

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

### Trigonometry Functions



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

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

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

### Pythagoras Theorem

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

### Unit Conversions

angles

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

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

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

.(2 marks) Solve for x in the following equation.

$$2ax + b = c$$

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

$$a + \frac{ax}{b^2} - c^2 = 4$$

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

$$\frac{2-a}{2-x}=\epsilon-1$$

$$1+\gamma^2=\Delta-\frac{\alpha}{\beta}(2ax+b)$$

$$\frac{3x^2-1}{c^2+1}+7=Z$$

$$V_o = 4 \cos(2x - \phi) + 7$$

(2 marks) Bonus: convert the following equation to computer syntax.

$$\frac{a + b}{x - 2} + c^{n-1} = 0$$

(2 marks) Solve for x in the following equation.

$$2ax + \overset{-b}{b} = \overset{-b}{c}$$

$$\frac{2ax}{2a} = \frac{c-b}{2a}$$

$$x = \frac{c-b}{2a}$$

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

$$\overset{-\alpha}{\alpha} + \frac{ax}{b^2} - \overset{+c^2}{c^2} = \overset{-\alpha + c^2}{4}$$

$$\frac{b^2}{a} \left( \frac{ax}{b^2} \right) = (4 - \alpha + c^2) \frac{b^2}{a}$$

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

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

$$(c-1) \left( \frac{2x-1}{c-1} \right) = (\Gamma-4)(c-1)$$

$$2x-1 = (\Gamma-4)(c-1)$$

$$\frac{2x}{2} = \frac{(\Gamma-4)(c-1) + 1}{2}$$

$$x = \frac{(\Gamma-4)(c-1) + 1}{2}$$

$$(2-x) \left( \frac{2-a}{2-x} \right) = (\epsilon-1)(2-x)$$

$$\frac{2-a}{\epsilon-1} = \frac{(\epsilon-1)(2-x)}{\epsilon-1}$$

$$\frac{2-a}{\epsilon-1} = 2-x$$

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

$$x = 2 - \frac{2-a}{\epsilon-1}$$

$$1 + \gamma^2 = \Delta - \frac{\alpha}{\beta}(2ax + b)$$

$$1 + \gamma^2 + \frac{\alpha}{\beta}(2ax + b) = \Delta$$

$$\frac{\beta}{\alpha} \left( \frac{\alpha}{\beta}(2ax + b) \right) = (\Delta - 1 - \gamma^2) \frac{\beta}{\alpha}$$

$$2ax + b = \frac{\beta}{\alpha}(\Delta - 1 - \gamma^2)$$

$$\frac{1}{2a}(2ax) = \left[ \frac{\beta}{\alpha}(\Delta - 1 - \gamma^2) - b \right] \frac{1}{2a}$$

$$x = \frac{1}{2a} \left[ \frac{\beta}{\alpha}(\Delta - 1 - \gamma^2) - b \right]$$

$$\frac{3x^2 - 1}{c^2 + 1} + 7 = Z$$

$$(c^2 + 1) \left( \frac{3x^2 - 1}{c^2 + 1} \right) = (Z - 7)(c^2 + 1)$$

$$3x^2 - 1 = (Z - 7)(c^2 + 1)$$

$$\frac{3x^2}{3} = \frac{(Z - 7)(c^2 + 1) + 1}{3}$$

$$(x^2)^{\frac{1}{2}} = \left( \frac{(Z - 7)(c^2 + 1) + 1}{3} \right)^{\frac{1}{2}}$$

$$x = \left[ \frac{(Z - 7)(c^2 + 1) + 1}{3} \right]^{\frac{1}{2}}$$

$$V_o = 4 \cos(2x - \phi) + 7$$

$$\frac{V_o - 7}{4} = \frac{4 \cos(2x - \phi)}{4}$$

$$\cos^{-1}\left(\frac{V_o - 7}{4}\right) = \cos^{-1}(\cos(2x - \phi))$$

$$\cos^{-1}\left(\frac{V_o - 7}{4}\right) = 2x - \phi$$

$$\frac{1}{2} \left[ \cos^{-1}\left(\frac{V_o - 7}{4}\right) + \phi \right] = (2x)^{\frac{1}{2}}$$

$$\frac{1}{2} \left[ \cos^{-1}\left(\frac{V_o - 7}{4}\right) + \phi \right] = x$$

$$x = \frac{1}{2} \left[ \cos^{-1}\left(\frac{V_o - 7}{4}\right) + \phi \right]$$

(2 marks) Bonus: convert the following equation to computer syntax.

$$\frac{a+b}{x-2} + c^{n-1} = 0$$

$$(a+b)/(x-2) + c^{(n-1)} = 0$$