MATH 1106 - Exam #1 (Version 1) Fall 2024

Time: 60 minutes

Student Name: _____ **Total:** _____/30 marks

Show all work, except where you used your calculator. To receive full marks, use the method that is requested in each question!

1. Perform the following calculation on your calculator. Express answer first in Engineering notation, then present final answer to 3 significant digits using the correct SI prefix. **[2 marks]**

$$\frac{(718.2\mu\text{A}+40.1\mu\text{A})}{(470\text{nA})(478\text{mA})}\times(3.68\text{A})^2 =$$

2. Given the function $f(x)=\dfrac{2x+4}{\sqrt{1-6x}}-\left(\dfrac{3}{x}\right)$ **[2 marks]**

(a) Determine the domain of the function. Write answer either as a set notation or an interval notation.

Domain: _____

(b) Determine the value of $f\left(-\dfrac{1}{2}\right)=$ _____ **(Leave answer in exact form)**

3. The equations below are derived from a circuit diagram using Kirchhoff's laws. Find the currents I_1, I_2 *and* I_3 (in Amps) running through each component. **Solve using your calculator. No work required!** Round answers to 3 significant digits. **[3 marks]**

$$\begin{cases} I_1+I_2+I_3=0 \\ 1.4I_1+2I_3=3 \\ 0.02I_2+0.1I_3=2 \end{cases}$$

Answer: $I_1=$_____; $I_2=$_____ ; $I_3=$_____

4. The voltage V (in Volts) for a certain electrical experiment was measured with respect to time t (in ms) and is shown in the table below. **[2 marks]**

Time (t, in ms)	1.0	1.5	2.0	2.5	3.0	3.5
Voltage (V, in Volts)	0.45	0.62	0.75	0.98	1.25	1.45

Use linear interpolation to estimate the voltage V (in Volts) at $t = 2.75$ ms. **Round answer to 3 decimal places. Include units for your answer.**

---

5. Given the matrices: $\mathbf{A} = \begin{pmatrix} -2 & -3 \\ 2 & 1 \end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix} 1 & -2 & 0 \\ 3 & -1 & 4 \end{pmatrix}$. Answer the 2 parts below.

(a) Calculate the product $\mathbf{A} \times \mathbf{B}$. **[1 mark]**

(b) Calculate the matrix: $4 \cdot A^{-1}$ **[1 mark]**

---

6. A disc 3.8 meters in diameter is rotating at 34 m/minute. Find the angular velocity of the outer rim of the disc in revolutions per second. **Answer to 3 significant digits.** **[3 marks]**

7. Answer the following 2 parts below: **[2 marks]**

(a) Determine the exact value of $\cot(-330^\circ) =$ _____

(b) Evaluate the instantaneous power P (in Watts) given by

$P = 2.45\cos^2(\omega \cdot t)$ at $t = 0.0125\ s$ if $\omega = 225\ rad/s$. **(Answer to 3 significant digits)**

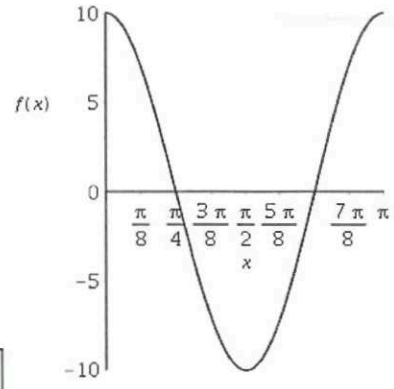
8. Solve the given system of equations using **EITHER Cramer's Rule** or **The Inverse Matrix Method.**
Marks will be given for using only one of these two methods. **[3 marks]**

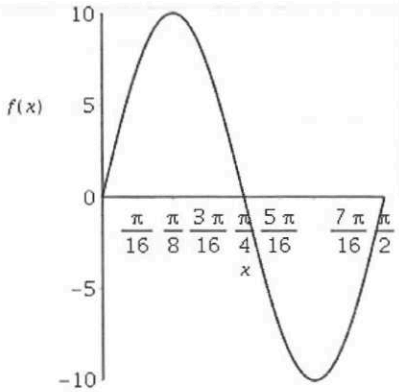
$$5x - 5(y+1) = 2$$
$$4x - 6 = 5y$$

(Leave your final answers as fractions)

9. For the waveforms shown below, match the graph with their appropriate equation. **[2 marks]**

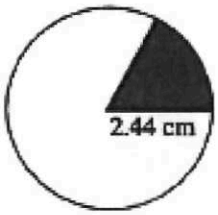
(A) $y = 10\sin\left(\frac{\pi x}{2}\right)$ (B) $y = 10\sin(4x)$ (C) $y = 10\cos(\pi x)$ (D) $y = 10\cos(2x)$





10. A computer is programmed to shade in a sector of a pie chart 2.44 cm in radius. If the area of the shaded sector is 2.90 cm^2, what is the central angle of the sector (in degrees, to 1 decimal place)? See the figure.

[2 marks]



---

11. Given $\cos\theta = -\frac{4}{5}$ and $\tan\theta > 0$. **Determine the angle(s)** $0^\circ \le \theta < 360^\circ$. **Answer(s) to 1 decimal place.**

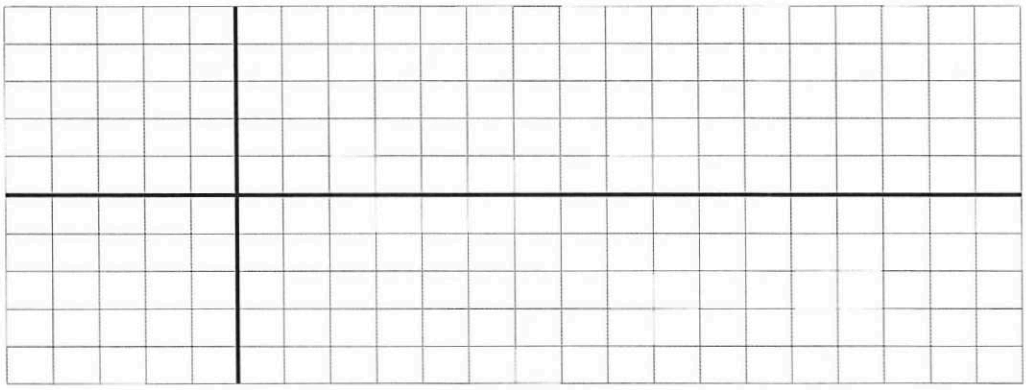
[2 marks]

---

12. The electric current in a certain circuit is given by $i(t) = 3\cos\left(2t - \frac{\pi}{4}\right)$.

Find the Period *T*, Amplitude A and the 5 key points for one cycle (max/min and *t*-intercepts).

Graph one cycle of this function. **[5 marks]**



Detailed Solutions

MATH 1106 - Exam #1 (Version 1) Fall 2024

Time: 60 minutes

Student Name: _____ **Total:** _____/30 marks

Show all work, except where you used your calculator. To receive full marks, use the method that is requested in each question!

1. Perform the following calculation on your calculator. Express answer first in Engineering notation, then present final answer to 3 significant digits using the correct SI prefix. **[2 marks]**

$$\frac{(718.2\mu A+40.1\mu A)}{(470nA)(478mA)}\times(3.68A)^2 = \frac{(718.2+40.1)\cdot 10^{-6}}{(470)(478)\cdot 10^{-9}\cdot 10^{-3}}\times 3.68^2 = \frac{0.010266493}{0.000000224}$$

$= 45697\,A$

$= 45.7\cdot 10^3\,A$

$\boxed{45.7\,kA}$

2. Given the function $f(x)=\dfrac{2x+5}{\sqrt{1-6x}}-\left(\dfrac{3}{x}\right)$ **[2 marks]**

(a) Determine the domain of the function. Write answer either as a set notation or an interval notation.

Domain: $x\in\mathbb{R},\ x<\frac{1}{6},\ x\neq 0$

$1-6x>0 \Rightarrow x<\frac{1}{6}$

$x\neq 0$

(b) Determine the value of $f\left(-\frac{1}{2}\right)=$ $\dfrac{2(-\frac{1}{2})+4}{\sqrt{1-6(-\frac{1}{2})}}-\dfrac{3}{(-\frac{1}{2})}$ **(Leave answer in exact form)**

$= \frac{3}{\sqrt{4}}+6 = \frac{3}{2}+6 = \boxed{\frac{15}{2}}$

3. The equations below are derived from a circuit diagram using Kirchhoff's laws. Find the currents I_1, I_2 *and* I_3 (in Amps) running through each component. **Solve using your calculator. No work required!** Round answers to 3 significant digits. **[3 marks]**

$$\begin{cases} I_1+I_2+I_3=0 \\ 1.4I_1+2I_3=3 \\ 0.02I_2+0.1I_3=2 \end{cases}$$

$\Rightarrow 1\cdot I_1+1\cdot I_2+1\cdot I_3=0$

$1.4I_1+0I_2+2I_3=3$

$0I_1+0.02I_2+0.1I_3=2$

MODE [4] [1]

a_1 [1]

b_1 [1]

c_1 [1]

d_1 [0]

etc.

enter all coeffs

Answer: $I_1 = -24.7\,A$; $I_2 = 5.92\,A$; $I_3 = 18.8\,A$

4. The voltage V (in Volts) for a certain electrical experiment was measured with respect to time t (in ms) and is shown in the table below. **[2 marks]**

2.75

Time (t, in ms)	1.0	1.5	2.0	2.5	3.0	3.5
Voltage (V, in Volts)	0.45	0.62	0.75	0.98	1.25	1.45

Use linear interpolation to estimate the voltage V (in Volts) at $t = 2.75$ ms. **Round answer to 3 decimal places. Include units for your answer.**

2.5 2.75 3.0
0.98 V 1.25

$$\Rightarrow \frac{2.75-2.5}{3.0-2.5} = \frac{V-0.98}{1.25-0.98}$$

$$\Rightarrow 0.5 = \frac{V-0.98}{0.27}$$

$$\Rightarrow V-0.98 = (0.5)(0.27) \Rightarrow V = 0.98+0.135$$

$V = 1.115$ Volts

5. Given the matrices: $\mathbf{A} = \begin{pmatrix} -2 & -3 \\ 2 & 1 \end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix} 1 & -2 & 0 \\ 3 & -1 & 4 \end{pmatrix}$. Answer the 2 parts below.

(a) Calculate the product $\mathbf{A} \times \mathbf{B}$. **[1 mark]**

$$A \times B = \begin{pmatrix} -2 & -3 \\ 2 & 1 \end{pmatrix} \times \begin{pmatrix} 1 & -2 & 0 \\ 3 & -1 & 4 \end{pmatrix} = \begin{pmatrix} -11 & 7 & -12 \\ 5 & -5 & 4 \end{pmatrix}$$

(b) Calculate the matrix: $4 \cdot A^{-1}$ **[1 mark]**

$$A^{-1} = \frac{1}{\det A} \begin{pmatrix} 1 & 3 \\ -2 & -2 \end{pmatrix} = \frac{1}{4} \begin{pmatrix} 1 & 3 \\ -2 & -2 \end{pmatrix} \Rightarrow 4 \cdot A^{-1} = 4\left(\frac{1}{4}\right)\begin{pmatrix} 1 & 3 \\ -2 & -2 \end{pmatrix}$$

$$\det A = (-2)(1) - (-3)(2) = 4$$

$4 \cdot A^{-1} \Rightarrow \begin{pmatrix} 1 & 3 \\ -2 & -2 \end{pmatrix}$

6. A disc 3.8 meters in diameter is rotating at 34 m/minute. Find the angular velocity of the outer rim of the disc in revolutions per second. **Answer to 3 significant digits.** **[3 marks]**

$d = 3.8$ m $\Rightarrow$ radius $r = \frac{3.8}{2}$ m $= 1.9$ m.

$$V = \frac{34 \text{ m}}{\text{min}} = \frac{34 \text{ m}}{60 \text{ sec}} = 0.566\overline{6} \frac{\text{m}}{\text{sec}}$$

$0.0475 \frac{\text{rev}}{\text{sec}}$

Angular velocity $\omega = \frac{V}{r} = \frac{0.566\overline{6}}{1.9} \frac{\text{rad}}{\text{sec}} \times \left(\frac{1}{2\pi}\right) \frac{\text{rev}}{\text{rad}}$

7. Answer the following 2 parts below: **[2 marks]**

$\frac{1}{\tan(-330^\circ)} = \frac{-1}{\tan(30^\circ)} = -\frac{1}{\frac{1}{\sqrt{3}}} = -\sqrt{3}$

(a) Determine the exact value of $\cot(-330^\circ) =$ $\sqrt{3}$

(b) Evaluate the instantaneous power P (in Watts) given by

$P = 2.45\cos^2(\omega \cdot t)$ at $t = 0.0125\ s$ if $\omega = 225\ rad/s$. **(Answer to 3 significant digits)**

$P = 2.45 \cdot (\cos(225 \cdot 0.0125))^2 = 2.19\,W$ (Use RAD mode)

8. Solve the given system of equations using **EITHER Cramer's Rule or The Inverse Matrix Method. Marks will be given for using only one of these two methods.** **[3 marks]**

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

$4x - 6 = 5y$

(Leave your final answers as fractions)

Use inverse matrix method

$\begin{cases} 5x - 5y = 7 \\ 4x - 5y = 6 \end{cases}$

$X = A^{-1} \cdot C = \frac{1}{-5} \cdot \begin{pmatrix} -5 & 5 \\ -4 & 5 \end{pmatrix} \begin{pmatrix} 7 \\ 6 \end{pmatrix} = -\frac{1}{5} \begin{pmatrix} -35+30 \\ -28+30 \end{pmatrix}$

Let $A = \begin{pmatrix} 5 & -5 \\ 4 & -5 \end{pmatrix}$, $C = \begin{pmatrix} 7 \\ 6 \end{pmatrix}$

$\Rightarrow X = \begin{pmatrix} -\frac{1}{5}(-5) \\ \frac{2}{-5} \end{pmatrix} = \begin{pmatrix} 1 \\ -\frac{2}{5} \end{pmatrix}$

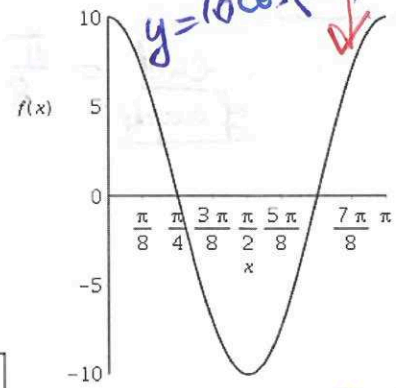
$\hookrightarrow \det A = (5)(-5) - (4)(-5) = -25 + 20 = -5$

$x = 1$

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

9. For the waveforms shown below, match the graph with their appropriate equation. **[2 marks]**

(A) $y = 10\sin\left(\frac{\pi x}{2}\right)$ (B) $y = 10\sin(4x)$ (C) $y = 10\cos(\pi x)$ (D) $y = 10\cos(2x)$

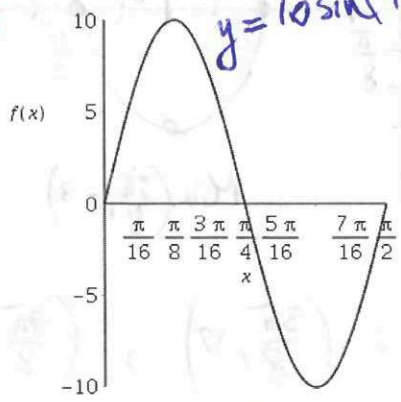


D

Ampl = 10

Per = π

$\omega = \frac{2\pi}{T} = \frac{2\pi}{\pi} = 2\ \frac{rad}{sec} \Rightarrow$

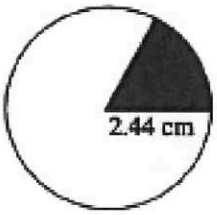


B

Per = $\frac{\pi}{2}$

$\omega = \frac{2\pi}{\frac{\pi}{2}} = 4\ \frac{rad}{sec}$ Ampl = 10

10. A computer is programmed to shade in a sector of a pie chart 2.44 cm in radius. If the area of the shaded sector is 2.90 cm^2, what is the central angle of the sector (in degrees, to 1 decimal place)? See the figure. **[2 marks]**



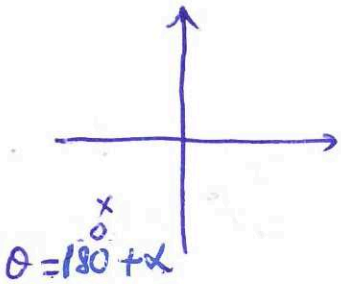
$A = \frac{r^2 \cdot \theta}{2} = 2.90 \Rightarrow \theta = \frac{2 \cdot (2.90)}{2.44^2}$

$\theta = 0.9742004833$

$\theta = 0.9742004833\left(\frac{180^\circ}{\pi}\right) = \boxed{55.8^\circ}$

---

11. Given $\cos\theta = -\frac{4}{5}$ and $\tan\theta > 0$. **Determine the angle(s)** $0 \le \theta < 2\pi$. **Answer(s) to 4 decimal places.** **[2 marks]**



$\theta \in$ QIII

Reference angle: $\alpha = \cos^{-1}\left(\frac{4}{5}\right) = 36.9^\circ$

$\theta = 180^\circ + \alpha = 180^\circ + 36.9^\circ = \boxed{216.9^\circ}$

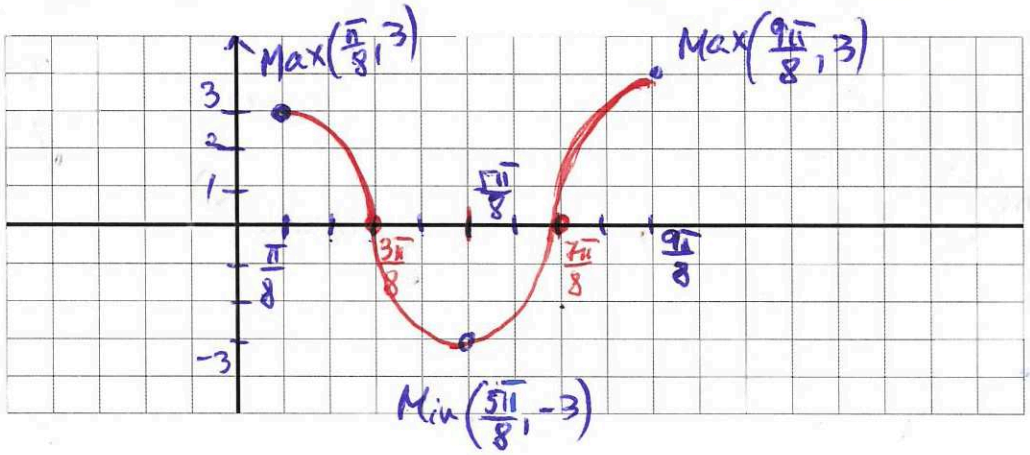
---

12. The electric current in a certain circuit is given by $i(t) = 3\cos\left(2t - \frac{\pi}{4}\right)$.

Find the Period T, Amplitude A and the 5 key points for one cycle (max/min and t-intercepts).

$T = \frac{2\pi}{2} = \pi$, $A = 3$

Graph one cycle of this function. **[5 marks]**



start of a cycle: $2t - \frac{\pi}{4} = 0$

$t = \frac{\pi}{8}$

end of a cycle $= \frac{\pi}{8} + \pi = \frac{9\pi}{8}$

t intercepts: $\left(\frac{3\pi}{8}, 0\right)$, $\left(\frac{7\pi}{8}, 0\right)$

MATH 1106 - Exam #1 (Version 2) Fall 2024

Time: 60 minutes

Student Name: _____ **Total:** _____/30 marks

Show all work, except where you used your calculator. To receive full marks, use the method that is requested in each question!

1. Perform the following calculation on your calculator. Express answer first in Engineering notation, then present final answer to 3 significant digits using the correct SI prefix. **[2 marks]**

$$\frac{(712.8\mu\text{A}+45.1\mu\text{A})}{(476\text{mA})(452\text{nA})}\times(3.58\text{A})^2 =$$

2. Given the function $f(x)=\dfrac{3x+4}{\sqrt{2-6x}}-\left(\dfrac{2}{x}\right)$ **[2 marks]**

(a) Determine the domain of the function. Write answer either as a set notation or an interval notation.

Domain: _____

(b) Determine the value of $f\left(-\dfrac{1}{3}\right)=$ _____ **(Leave answer in exact form)**

3. The equations below are derived from a circuit diagram using Kirchhoff's laws. Find the currents I_1, I_2 *and* I_3 (in Amps) running through each component. **Solve using your calculator. No work required!** Round answers to 3 significant digits. **[3 marks]**

$$\begin{cases} I_1+I_2+I_3=0 \\ 1.4I_1+2I_3=3 \\ 0.02I_2+0.1I_3=2 \end{cases}$$

Answer: $I_1=$_____; $I_2=$_____ ; $I_3=$_____

4. The voltage V (in Volts) for a certain electrical experiment was measured with respect to time t (in ms) and is shown in the table below. **[2 marks]**

Time (t, in ms)	1.0	1.5	2.0	2.5	3.0	3.5
Voltage (V, in Volts)	0.45	0.62	0.75	0.98	1.25	1.45

Use linear interpolation to estimate the voltage V (in Volts) at $t = 3.35$ ms. **Round answer to 3 decimal places. Include units for your answer.**

---

5. Given the matrices: $\mathbf{A} = \begin{pmatrix} 2 & -2 \\ 1 & 3 \end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix} 1 & -2 & 0 \\ 3 & -1 & 4 \end{pmatrix}$. Answer the 2 parts below.

(a) Calculate the product $\mathbf{A} \times \mathbf{B}$ **[1 mark]**

(b) Calculate the matrix: $8 \cdot A^{-1}$ **[1 mark]**

---

6. A disc 3.2 meters in diameter is rotating at 38 m/minute. Find the angular velocity of the outer rim of the disc in revolutions per second. **Answer to 3 significant digits.** **[3 marks]**

7. Answer the following 2 parts below: **[2 marks]**

(a) Determine the exact value of $\cot(-300^\circ) =$ _____

(b) Evaluate the instantaneous power P (in Watts) given by

$P = 2.45\sin^2(\omega \cdot t)$ at $t = 0.0125\ s$ if $\omega = 325\ rad/s$. **(Answer to 3 significant digits)**

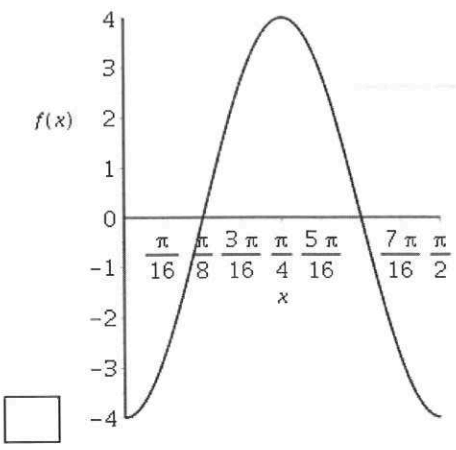
8. Solve the given system of equations using **EITHER Cramer's Rule or The Inverse Matrix Method. Marks will be given for using only one of these two methods.** **[3 marks]**

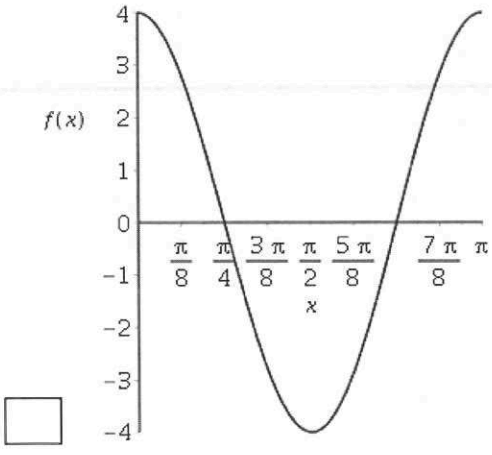
$$5x - 5(y+1) = 3$$
$$-4x + 6 = -5y$$

(Leave your final answers as fractions)

9. For the waveform shown below, which of the following equations best describes the graph? **[2 marks]**

(A) $y = -4\sin\left(\frac{\pi x}{2}\right)$ (B) $y = -4\sin(4x)$ (C) $y = 4\cos(2x)$ (D) $y = 4\cos(\pi x)$





10. A computer is programmed to shade in a sector of a pie chart 2.44 cm in radius. If the area of the shaded sector is 2.95 cm^2, what is the central angle of the sector (in degrees, to 1 decimal place)? See the figure.

[2 marks]

---

11. Given $\sin\theta = -\frac{3}{5}$ and $\tan\theta > 0$. **Determine the angle(s)** $0^\circ \le \theta < 360^\circ$. **Answer(s) to 1 decimal place.**

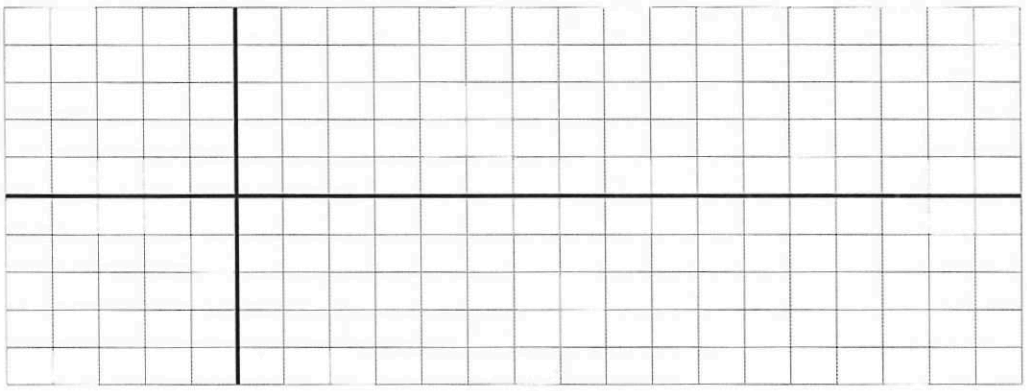
[2 marks]

---

12. The electric current in a certain circuit is given by $i(t) = 3\sin\left(2t - \frac{\pi}{6}\right)$.

Find the Period *T*, Amplitude A and the 5 key points for one cycle (max/min and *t*-intercepts).

Graph one cycle of this function. **[5 marks]**



Detailed solutions

MATH 1106 - Exam #1 (Version 2)

Fall 2024

Time: 60 minutes

Student Name: _____ **Total:** _____/30 marks

Show all work, except where you used your calculator. To receive full marks, use the method that is requested in each question!

1. Perform the following calculation on your calculator. Express answer first in Engineering notation, then present final answer to 3 significant digits using the correct SI prefix. **[2 marks]**

$$\frac{(712.8\mu A+45.1\mu A)}{(476mA)(452nA)}\times(3.58A)^2 = \frac{(712.8+45.1)\cdot 10^{-6}\ A}{(476\times10^{-3})(452\times10^{-9})A^2}\cdot(3.58)^2A^2$$

$$= \frac{0.009713549}{0.000000215}\ A = 45.1\times10^{3}A$$

$$= \boxed{45.1\ kA}$$

2. Given the function $f(x)=\dfrac{3x+4}{\sqrt{2-6x}}-\left(\dfrac{2}{x}\right)$ **[2 marks]**

(a) Determine the domain of the function. Write answer either as a set notation or an interval notation.

Domain: $x\in\mathbb{R},\ x<\frac{1}{3},\ x\neq 0$

(b) Determine the value of $f\left(-\dfrac{1}{3}\right)=$ $\dfrac{3(-\frac{1}{3})+4}{\sqrt{2-6(\frac{1}{3})}}-\dfrac{2}{(-\frac{1}{3})}$ **(Leave answer in exact form)**

$$=\frac{3}{2}+6=\boxed{\frac{15}{2}}$$

3. The equations below are derived from a circuit diagram using Kirchhoff's laws. Find the currents I_1, I_2 *and* I_3 (in Amps) running through each component. **Solve using your calculator. No work required!** Round answers to 3 significant digits. **[3 marks]**

$$\begin{cases} I_1+I_2+I_3=0 \\ 1.4I_1+2I_3=3 \\ 0.02I_2+0.1I_3=2 \end{cases}$$

$$\begin{cases} 1I_1+1\cdot I_2+1\cdot I_3=0 \\ 1.4I_1+0I_2+2I_3=3 \\ 0I_1+0.02I_2+0.1I_3=2 \end{cases}$$

Answer: $I_1=$ $-24.7A$; $I_2=$ $5.92A$; $I_3=$ $18.8A$

4. The voltage V (in Volts) for a certain electrical experiment was measured with respect to time t (in ms) and is shown in the table below. **[2 marks]**

3.35 V

Time (t, in ms)	1.0	1.5	2.0	2.5	3.0	3.5
Voltage (V, in Volts)	0.45	0.62	0.75	0.98	1.25	1.45

Use linear interpolation to estimate the voltage V (in Volts) at $t = 3.35$ ms. **Round answer to 3 decimal places. Include units for your answer.**

3.0 3.35 3.5
1.25 V 1.45 $\Rightarrow$ $\frac{3.35-3.0}{3.5-3.0} = \frac{V-1.25}{1.45-1.25}$

$\Rightarrow 0.7 = \frac{V-1.25}{0.20} \Rightarrow V-1.25 = (0.7)(0.20)$

$V = 1.25 + 0.14$

$V = 1.390$ Volts

---

5. Given the matrices: $\mathbf{A} = \begin{pmatrix} 2 & -2 \\ 1 & 3 \end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix} 1 & -2 & 0 \\ 3 & -1 & 4 \end{pmatrix}$. Answer the 2 parts below.

(a) Calculate the product $\mathbf{A} \times \mathbf{B}$ $= \begin{pmatrix} 2 & -2 \\ 1 & 3 \end{pmatrix}\begin{pmatrix} 1 & -2 & 0 \\ 3 & -1 & 4 \end{pmatrix}$ **[1 mark]**

$$A \times B = \begin{pmatrix} -4 & -2 & -8 \\ 10 & -5 & 12 \end{pmatrix}$$

(b) Calculate the matrix: $8 \cdot A^{-1}$ **[1 mark]**

$A^{-1} = \frac{1}{\det(A)} \cdot \begin{pmatrix} 3 & 2 \\ -1 & 2 \end{pmatrix} = \frac{1}{8} \cdot \begin{pmatrix} 3 & 2 \\ -1 & 2 \end{pmatrix} \Rightarrow 8 \cdot A^{-1} = 8 \cdot \frac{1}{8} \begin{pmatrix} 3 & 2 \\ -1 & 2 \end{pmatrix}$

$\det(A) = (2)(3) - (1)(-2) = 8$

$$\Rightarrow 8 \cdot A^{-1} = \begin{pmatrix} 3 & 2 \\ -1 & 2 \end{pmatrix}$$

---

6. A disc 3.2 meters in diameter is rotating at 38 m/minute. Find the angular velocity of the outer rim of the disc in revolutions per second. **Answer to 3 significant digits.** **[3 marks]**

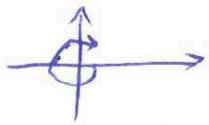
diam $d = 3.2$ m $\Rightarrow$ radius $r = \frac{d}{2} = 1.6$ m.

$\omega = ?$ given $V = 38 \frac{m}{min} = \frac{38}{60} \frac{m}{sec} = 0.6333 \frac{m}{sec}$

$\omega = \frac{V}{r} = \frac{0.6333}{1.6} \frac{rad}{sec} = \frac{0.6333}{1.6} \cdot \frac{1}{2\pi} \frac{rev}{sec}$

(convert to $\frac{rev}{sec}$)

$\omega = 0.0630 \frac{rev}{sec}$



7. Answer the following 2 parts below: **[2 marks]**

(a) Determine the exact value of $\cot(-300^\circ) =$ $\frac{1}{\tan(-300^\circ)} = \frac{1}{\tan(60^\circ)} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

(b) Evaluate the instantaneous power P (in Watts) given by

$P = 2.45\sin^2(\omega \cdot t)$ at $t = 0.0125\ s$ if $\omega = 325\ rad/s$. **(Answer to 3 significant digits)**

$P = 2.45 \cdot (\sin(325 \cdot 0.0125))^2 = 1.55\ W$

8. Solve the given system of equations using **EITHER Cramer's Rule** or **The Inverse Matrix Method.** **Marks will be given for using only one of these two methods.** **[3 marks]**

$5x - 5(y+1) = 3$

$-4x + 6 = -5y$

(Leave your final answers as fractions)

Use Cramer's Rule

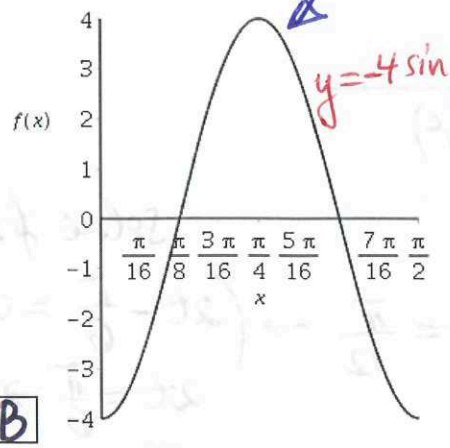
$\begin{cases} 5x - 5y = 8 \\ 4x - 5y = 6 \end{cases} \Rightarrow$

$x = \frac{\begin{vmatrix} 8 & -5 \\ 6 & -5 \end{vmatrix}}{\begin{vmatrix} 5 & -5 \\ 4 & -5 \end{vmatrix}} = \frac{D_x}{D} = \frac{-40+30}{-25+20} = \frac{-10}{-5} = 2$ $\quad x = 2$

$y = \frac{D_y}{D} = \frac{\begin{vmatrix} 5 & 8 \\ 4 & 6 \end{vmatrix}}{-5} = \frac{30-32}{-5} = \frac{2}{5} \Rightarrow$ $x = 2,\ y = \frac{2}{5}$

9. For the waveform shown below, which of the following equations best describes the graph? **[2 marks]**

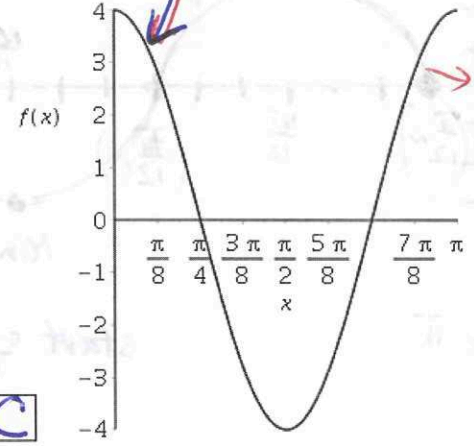
(A) $y = -4\sin\left(\frac{\pi x}{2}\right)$ (B) $y = -4\sin(4x)$ (C) $y = 4\cos(2x)$ (D) $y = 4\cos(\pi x)$



B $\quad y = -4\sin(4x)$

Ampl = 4

Per $T = \frac{\pi}{2} \Rightarrow \omega = \frac{2\pi}{\pi/2} = 4\ \frac{rad}{sec}$

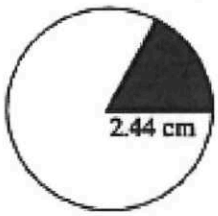


C $\quad y = 4\cos(2x)$

Ampl = 4

Per $T = \pi \Rightarrow \omega = \frac{2\pi}{\pi} = 2\ rad/sec$

10. A computer is programmed to shade in a sector of a pie chart 2.44 cm in radius. If the area of the shaded sector is 2.95 cm^2, what is the central angle of the sector (in degrees, to 1 decimal place)? See the figure. **[2 marks]**



$A = \frac{r^2\theta}{2} = 2.95$

$\rightarrow \theta = \frac{2\cdot(2.95)}{2.44^2} = 0.990997043$ rad

Given $r = 2.44$ cm

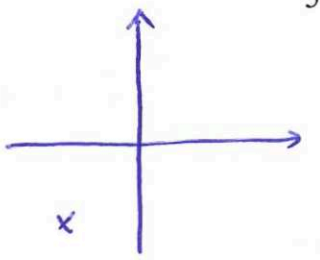
$A = 2.95$

$\theta = 0.99099\ldots^\circ\left(\frac{180^\circ}{\pi}\right) = \boxed{56.8^\circ}$

---

11. Given $\sin\theta = -\frac{3}{5}$ and $\tan\theta > 0$. **Determine the angle(s)** $0^\circ \le \theta < 360^\circ$. **Answer(s) to 1 decimal place.**

[2 marks]



$\theta \in Q_{III}$

Reference angle: $\alpha = \sin^{-1}\left(\frac{3}{5}\right) = 36.9^\circ$

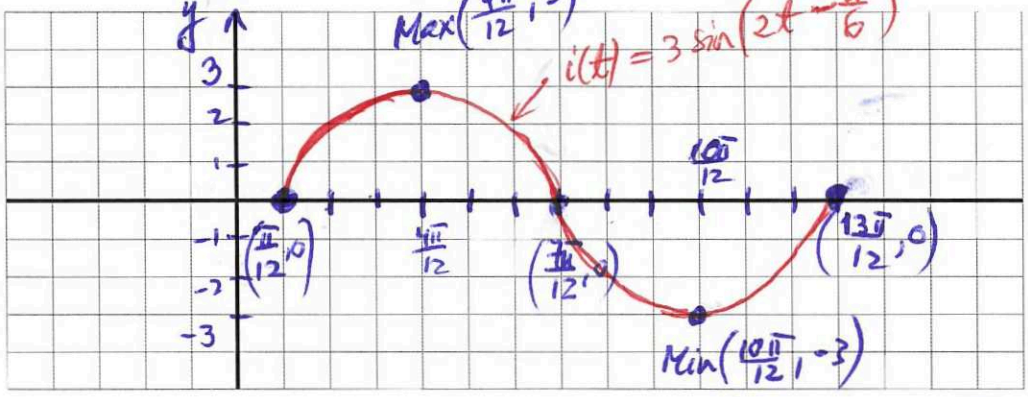
$\theta = 180^\circ + \alpha = 180^\circ + 36.9^\circ = \boxed{216.9^\circ}$ one solution.

---

12. The electric current in a certain circuit is given by $i(t) = 3\sin\left(2t - \frac{\pi}{6}\right)$.

Find the Period T, Amplitude A and the 5 key points for one cycle (max/min and t-intercepts).

Graph one cycle of this function. **[5 marks]**



Per. $T = \frac{2\pi}{2} = \pi$

Ampl. $A = 3$.

start of a cycle $= \frac{\pi}{12}$ → solve for t: $2t - \frac{\pi}{6} = 0$, $2t = \frac{\pi}{6} \rightarrow t = \frac{\pi}{12}$

end of a cycle $= \frac{\pi}{12} + \pi = \frac{13\pi}{12}$

t-intercepts: $\left(\frac{\pi}{12}, 0\right), \left(\frac{7\pi}{12}, 0\right), \left(\frac{13\pi}{12}, 0\right)$