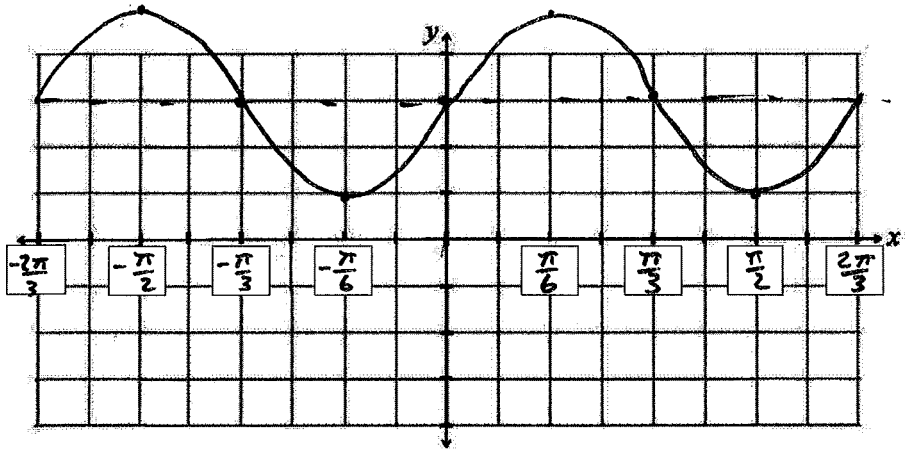
Fab Five 2nd Semester Review Advanced Math

Directions: $y = 3 + 2\cos(3(x + \frac{\pi}{2}))$ $\frac{2\pi}{3}$

1. Graph $y = 3 + 2\cos(3x + \frac{3\pi}{2})$



Period = $\frac{2\pi}{3}$

Phase shift = $-\frac{\pi}{2}$

Amplitude = 2

Vertical Shift = 3

3. Identify the domain for the functions sin x, cos x, tan x, csc x, sec x, and cot x.

sin x	cos x	tan x	csc x	sec x	cot x
$\mathbb{R}$	$\mathbb{R}$	$\mathbb{R}$, $x \neq \frac{\pi}{2} + \pi n$	$x \neq \pi n$	$x \neq \frac{\pi}{2} + \pi n$	$x \neq \pi n$

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Chapter 7

1. Prove $\dfrac{\cos x+1}{\tan^2 x}=\dfrac{\cos x}{\sec x-1}$

Cross Multiply

$(\cos x+1)\left(\frac{1}{\cos x}-1\right)=\left(\frac{\sin^2 x}{\cos^2 x}\right)(\cos x)$

Foil

$1-\cos x+\frac{1}{\cos x}-1=\frac{\sin^2 x}{\cos x}$

$\frac{-\cos^2 x+1}{\cos x}=\frac{\sin^2 x}{\cos x}$

$\frac{\sin^2 x}{\cos x}=\frac{\sin^2 x}{\cos x}$

2. Using the formula for cos (x + y)... find the cos 105 degrees.

$\cos(45+60)$

$\left(\frac{\sqrt{2}}{2}\right)\left(\frac{1}{2}\right)-\left(\frac{\sqrt{2}}{2}\right)\left(\frac{\sqrt{3}}{2}\right)$

$\boxed{\frac{\sqrt{2}-\sqrt{6}}{2}}$

3. Solve $2\sin^2 x+\sin x-1=0$

Let $u=\sin x$

$2u^2+u-1=0$

$(2u-1)(u+1)=0$

$u=\frac{1}{2} \quad u=-1$

$\sin x=\frac{1}{2} \quad \sin x=-1$

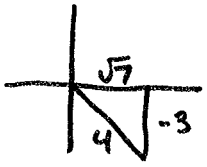
Principal values =

$x=\frac{\pi}{6} \quad x=\frac{3\pi}{2}$

$0\le x\le 360$ =

$x=\frac{\pi}{6},\frac{5\pi}{6},\frac{3\pi}{2}$

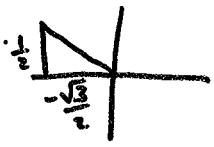
4. Using the formula $\sin 2x = 2\sin x\cos x$ find $\sin 2x$ if $270\le x\le 360$ and $\sin x = -3/4$.



$2\left(\frac{-3}{4}\right)\left(\frac{\sqrt{7}}{4}\right)$

$\boxed{\frac{-3\sqrt{7}}{8}}$

5. $\tan(\cos^{-1}(-\frac{\sqrt{3}}{2}))$ Quadrant 2.



$\boxed{-\frac{\sqrt{3}}{3}}$

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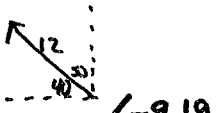
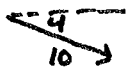
Chapter 8

1. A boat is set to travel at a speed of 12 knots in the direction 50° west of north. The current is moving at a speed of 10 knots in the direction 4° south of east. Find the *x* and *y* components of the vector representing the boat's actual velocity relative to the land.





$\langle -9.19, 7.71 \rangle + \langle 9.98, -.7 \rangle = \boxed{\langle .79, 7.01 \rangle}$

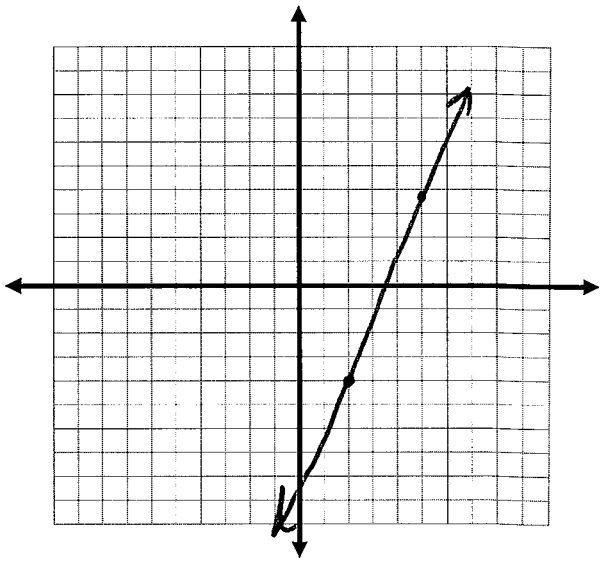
2. Graph the line represented by the parametric equations:

$x = 2 + 3t$

$y = -4 + 8t$

$M = \frac{8}{3}$

$(2, -4)$



3. Given the formula $\cos x = \frac{\vec{u} \bullet \vec{v}}{|\vec{u}||\vec{v}|}$, find the angle, *x*, between ***u*** and ***w***.

U = (-4,2) w = (-3,-4)

$\vec{u} \cdot \vec{w} = (-4)(-3) + 2(-4) = 4$

$|\vec{u}| = \sqrt{16+4} = \sqrt{20}$

$|\vec{w}| = \sqrt{9+16} = 5$

$\cos x = \frac{4}{(\sqrt{20})(5)}$

$\boxed{x \approx 79.7°}$

4. Find the magnitude **and** direction of the vector (-6,2).

Mag: $\sqrt{36+4}$

$\sqrt{40}$

$\approx \boxed{6.3}$

Dir: $\tan^{-1}\left(\frac{2}{6}\right) = 18.4°$

$\boxed{161.7°}$

5. Find two vectors perpendicular to the vector (5 , -7)

$\langle 7, 5 \rangle$ or $\langle -7, -5 \rangle$

Adv. Math Exam Review Chapter 11..... FAB FIVE!!!!!!

1. Solve. $\log 0.1^{(2x+8)} \geq \log 7^{(x+4)}$

$(2x+8)\cdot\log.1 \geq (x+4)\cdot\log 7$

$-2x-8 \geq .8451x + 3.38$

$-2.8451x \geq 11.38$

$x \leq -3.9999$

2. Solve. $e^{2x} > 20$

$\frac{2x}{2} > \frac{\ln 20}{2}$

$x > 1.4979$

3. Find the balance after 11 years for a $7,500 investment earning 4.5% interest compounded continuously.

$7500e^{.045\cdot 11}$

$\$12,303.74$

4. Solve using log properties: $\log_4 3 + \log_4 x = \log_4 45$

$\log_4 3x = \log_4 45$

$3x = 45$

$x = 15$

5. Solve: $6^{(x-2)} = 30$

$(x-2)\log 6 = \log 30$

$x-2 = \frac{\log 30}{\log 6}$

$x-2 = 1.8982$

$x = 3.8982$

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Chapter 15A

1. Find the 2nd derivative of $y = -3x^5 + 7x^2 - 12x + 5$.

$y' = -15x^4 + 14x - 12$

$\boxed{y'' = -60x^3 + 14}$

2. Find the derivative of $\frac{x^2-2x}{e^x}$

$$\frac{(e^x)(2x-2) - (x^2-2x)(e^x)}{(e^x)^2}$$

$$\frac{e^x((2x-2)-(x^2-2x))}{(e^x)^2}$$

$$\frac{2x-2-x^2+2x}{e^x}$$

$$\boxed{\frac{-x^2+4x-2}{e^x}}$$

3. Find the instantaneous velocity and instantaneous acceleration of an object travelling on the path of $y = 4x^3 + 2x^2 - 5x + 4$ at $x = 2$ *seconds*.

$f'(x) = 12x^2 + 4x - 5$ $\qquad$ $f''(x) = 24x + 4$

$f'(2) = \boxed{51 \text{ ft./sec.}}$ Vel. $\qquad$ $f''(2) = \boxed{52 \text{ ft./sec}^2}$ Accel.

4. Evaluate $\lim_{x \to 3} \frac{x^2-3x-10}{x-5}$

$$\lim_{x \to 3} \frac{(x-5)(x+2)}{(x-5)} = \lim_{x \to 3} x+2 = 3+2 = \boxed{5}$$

5. Find the derivative of $y = \ln(\sin(4x + 2))$.

SKIP

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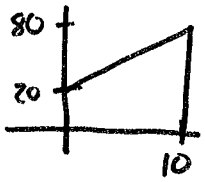
Chapter 5B

1. A car accelerates at from 20mph to 80mph in 10 seconds. How far did the car travel in 10 seconds.



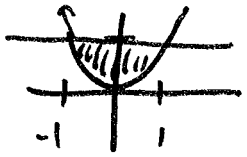
$\frac{1}{2}(10)(20+80)$

500 mi

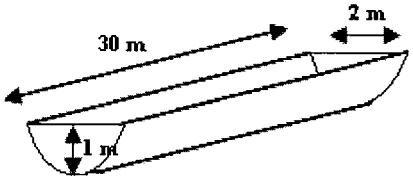
2. Evaluate $\int_{-1}^{5}(x^2+1)dx$

$\frac{x^3}{3}+x \Big|_{-1}^{5}$ $\quad \frac{140}{3}-\frac{(-4)}{3} = \frac{144}{3}$

3. A construction firm needs to fill in a parabolic trench that is 30 meters long. How much soil will the company need to completely fill the trench if its dimensions are 1 meter deep by 2 meters wide? Show all work!



$V = B \cdot h$



$\int_{-1}^{1}(1-x^2)dx = x-\frac{x^3}{3} \Big|_{-1}^{1}$ $\quad \left(\frac{2}{3}\right)-\left(-\frac{2}{3}\right) = \frac{4}{3}$

$V = \frac{4}{3} \cdot 30 =$ 40m³

4. Evaluate $\int_{-2}^{3}(x^2+2x)dx$

$\frac{x^3}{3}+x^2 \Big|_{-2}^{3}$

$18-\frac{4}{3} =$ $16\frac{2}{3}$

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Chapter 6

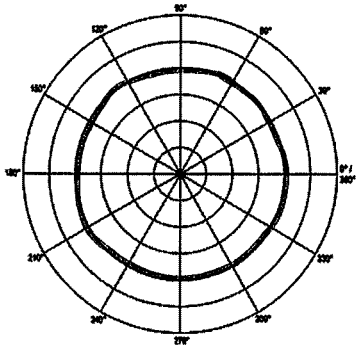
1. Write (1, 5) in polar form.

$r = \sqrt{1+25} \approx 5.1$

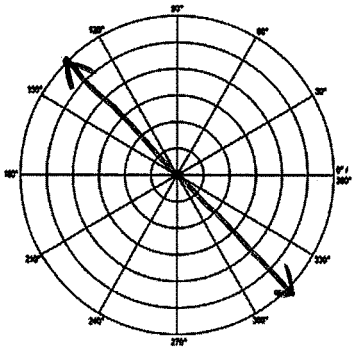
$\theta = \tan^{-1}\left(\frac{5}{1}\right) \approx 78.7°$

$[5.1, 78.7°]$

2. Graph: r = 4



3. Graph: $\theta = \frac{2\pi}{3}$



4. Write $[-4, 75°]$ in rectangular form.

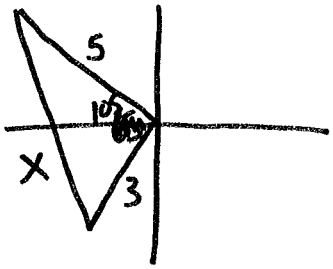
$x = -4\cos 75$

$y = -4\sin 75$

$(-1.0, -3.9)$

5. Find the distance between the two points with the given polar coordinates:

$P_1[5, 140°]$ and $P_2[3, -115°]$



$x^2 = 3^2 + 5^2 - 2(3)(5)\cos 105$

$x \approx 6.46$ units