SAT 2, IB and Friends of Trig Name:______________________ Per: ______ Group:_____ **IB**

1. The number of hours of daylight, d, in Hartsville can be modeled by $d=\frac{35}{3}+\frac{7}{3}\sin\left(\frac{2\pi}{365}t\right)$ where t is the number of days after March 21. The day with the greatest number of hours of daylight has how many more daylight hours than May 1? (March and May have 31 days each. April and June have 30 days each.)

$\frac{35}{3}+\frac{7}{3}\rightarrow\frac{42}{3}\rightarrow\boxed{14}$

$\boxed{\text{a. } 0.8 \text{ hr}}$ b. 1.5 hr c. 2.3 hr d. 3.0 hr e. 4.7 hr

	t	d
Mar21	0	$11.\bar{6}$
May1	41	13.18

$14-13.18\approx 0.8$

2. Let $f(x)=3\sin\left(\frac{\pi}{2}x\right)$, for $0\le x\le 4$.

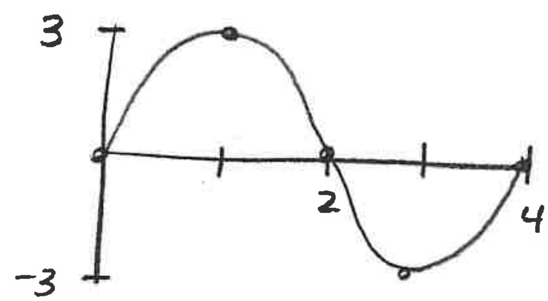
i. Write down the amplitude of f.

$\boxed{f=3}$

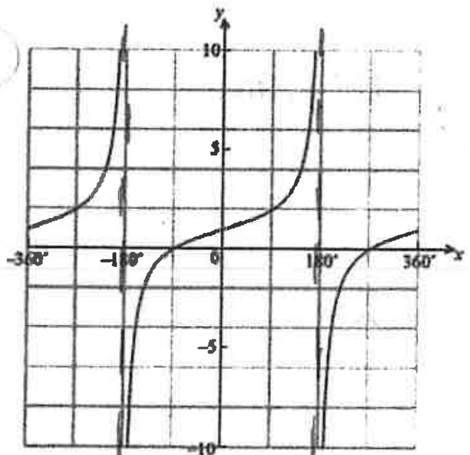
ii. Find the period of f. $2\pi\div\frac{\pi}{2}$

$2\pi\cdot\frac{2}{\pi}\rightarrow\boxed{4}$

iii. Graph f.



3. The diagram below shows the graph of $f(x)=1+\tan\left(\frac{x}{2}\right)$ for $-360^{o}\le x\le 360^{o}$



a. On the same axis draw the asymptotes.

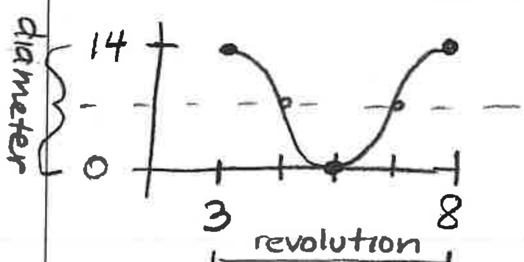
b. Write down:

the period of the function: 2π or 360°

the value of $f(90)$ 2

$f(90)=1+\tan\left(\frac{90}{2}\right)\rightarrow 1+\tan 45\rightarrow 1+1$

4. A nail in a tire rotates as the car drives. The nail is at its highest point at 3 seconds. The diameter of the tire is 14 inches. The nail makes a complete revolution every 5 seconds. Make a sketch and write an equation modeling this situation.



$y=7\sin\frac{2\pi}{5}(x-3)+7$

5. Find the roots of $P(x)=x^4+x^3-x^2+5x-30$

$\frac{P}{Q}=\pm1\pm2\pm3\pm5\pm6\pm10\pm15\pm30$

1 | 1 1 −1 5 −30
↓ 1 2 1 6
1 2 1 6 −24

2 | 1 1 −1 5 −30
↓ 2 6 10 30
1 3 5 15 ☺

$\boxed{x=2}$

$\boxed{x=-3}$

−3 | 1 3 5 15
↓ −3 0 −15
1 0 5 0

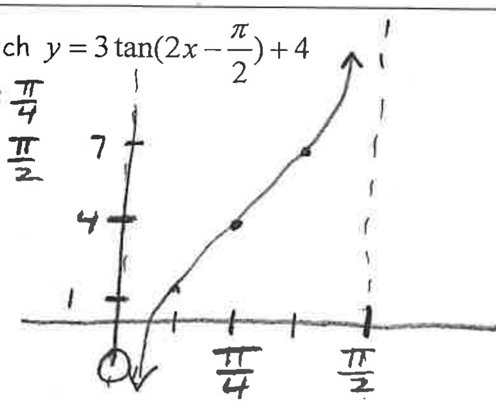
$x^2+5=0$

$\boxed{x=\pm\sqrt{5}}$

6. Sketch $y=3\tan(2x-\frac{\pi}{2})+4$

P.S. $=\frac{\pi}{4}$

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



7. The top and bottom were torn off the graph. A maximum occurred at 3 and the next minimum at 7.5 seconds. Christina knew that the height of 4 was first arrived at 0.9095 seconds. Use symmetry to calculate when the next two times the height is 4.

4.5sec

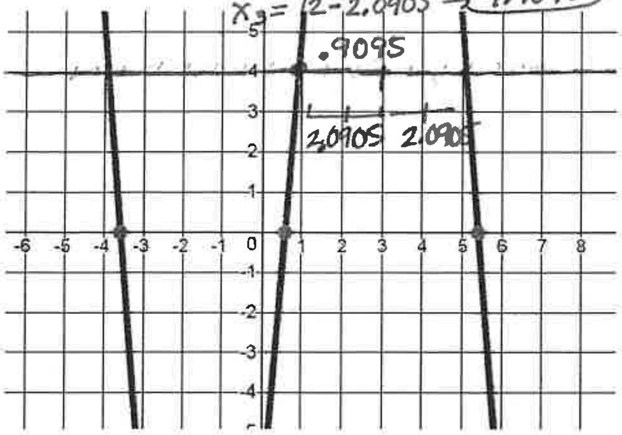
9 sec

$3+9 \to 12$

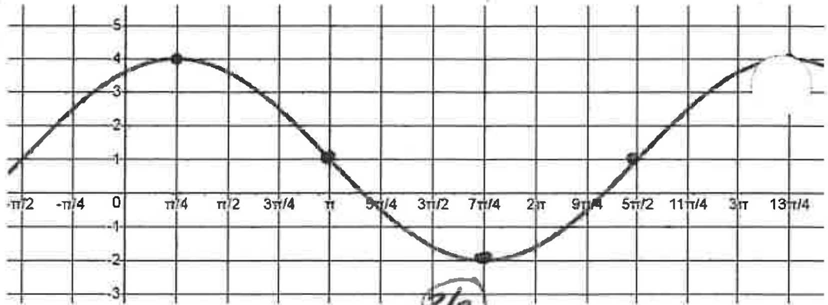
$x_1 = .9095$

$x_2 = 3 + 2.0905 \to \boxed{5.0905}$

$x_3 = 12 - 2.0905 \to \boxed{9.9095}$



8. Name the following trig function using sine & cosine



2/3

$\frac{12\pi}{4} \to 3\pi$

Cosine: $y = 3\cos \frac{2\pi}{3\pi}\left(x - \frac{\pi}{4}\right) + 1$

Sine: $y = -3\sin \frac{2}{3}(x - \pi) + 1$

9. Write $P(x) = 8x^3 - 27$ as the product of linear factors

$(2x-3)(4x^2+6x+9)=0$

$$\boxed{(2x-3)\left(x - \left(\frac{-3+3i\sqrt{3}}{4}\right)\right)\left(x - \left(\frac{-3-3i\sqrt{3}}{4}\right)\right)}$$

$x = \frac{-6 \pm \sqrt{36-4(4)(9)}}{8} \to \frac{-6 \pm \sqrt{-108}}{8}$

$= \frac{-6 \pm 6i\sqrt{3}}{8}$

$= \frac{-3 \pm 3i\sqrt{3}}{4}$

108

$4 \cdot 27$

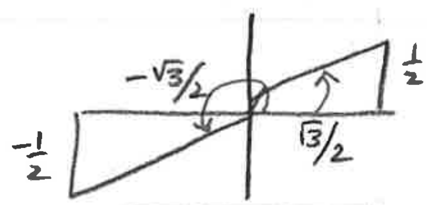
$4 \cdot 9 \cdot 3$

10.a) Solve for all x: $\csc x = -2$

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

$$\boxed{\frac{7\pi}{6} + 2\pi n, \quad \frac{11\pi}{6} + 2\pi n}$$

b) Solve for x between $[0, 2\pi)$: $\cot x = \frac{\sqrt{3}/2}{1/2}$



$$\boxed{\frac{\pi}{6}, \frac{7\pi}{6}}$$

11. Solve: $\log_3 4 + \log_3(x-5) = 3$

$\log_3(4x-20) = 3$

$3^3 = 4x - 20$

$27 = 4x - 20$

$47 = 4x$

$$\boxed{x = \frac{47}{4}}$$

12. Solve: $\left(\frac{2}{3}\right)^{7x-5} = \left(\frac{27}{8}\right)^2$

$\frac{2}{3}^{7x-5} = \left(\frac{2}{3}^{-3}\right)^2$

$7x - 5 = -6$

$7x = -1$

$$\boxed{x = -\frac{1}{7}}$$