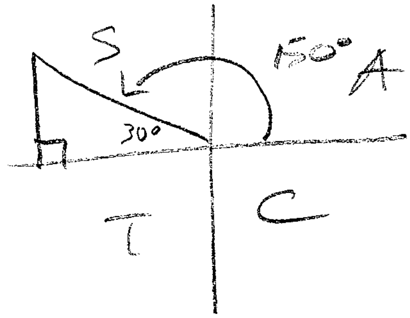
1a $\sin\left(\frac{5\pi}{6}\right)$

$= \sin(150°)$

$\sin 30° = \frac{1}{2}$

so $\sin \frac{5\pi}{6} = \frac{1}{2}$

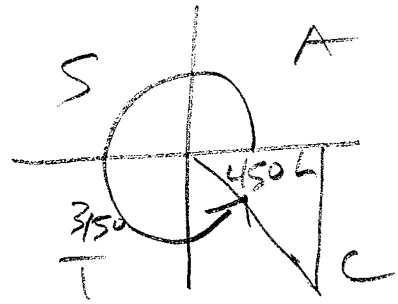


(b) $\tan\left(\frac{7\pi}{4}\right)$

$= \tan(315°)$

$\tan 45° = 1$

so $\tan\left(\frac{7\pi}{4}\right) = -1$

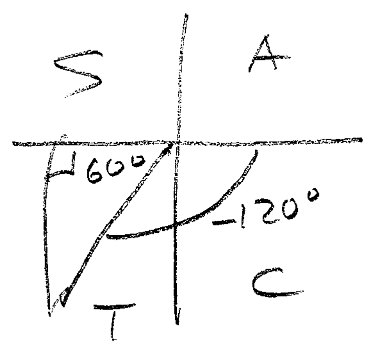


(c) $\cos\left(-\frac{2\pi}{3}\right)$

$= \cos(-120°)$

$\cos 60° = \frac{1}{2}$

so $\cos\left(-\frac{2\pi}{3}\right) = -\frac{1}{2}$



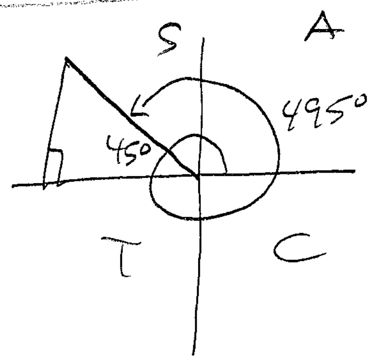
(d) $\sin\left(\frac{11\pi}{4}\right)$

$= \sin 495°$

$= \sin 135°$

$\sin 45° = \frac{\sqrt{2}}{2}$

so $\sin \frac{11\pi}{4} = \frac{\sqrt{2}}{2}$



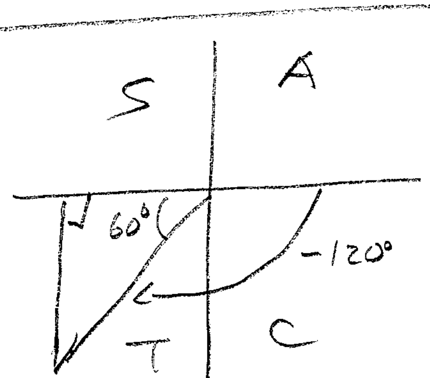
(e) $\tan\left(-\frac{8\pi}{3}\right)$

$= \tan(-480°)$

$= \tan(-120°)$

$\tan 60° = \sqrt{3}$

so $\tan\left(-\frac{8\pi}{3}\right) = \sqrt{3}$

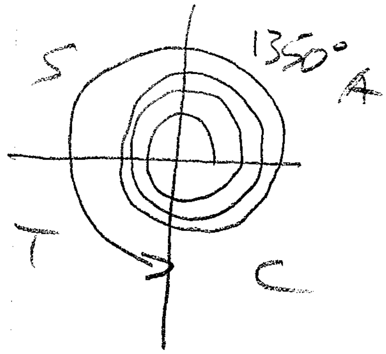


(f) $\cos(15\frac{\pi}{2})$

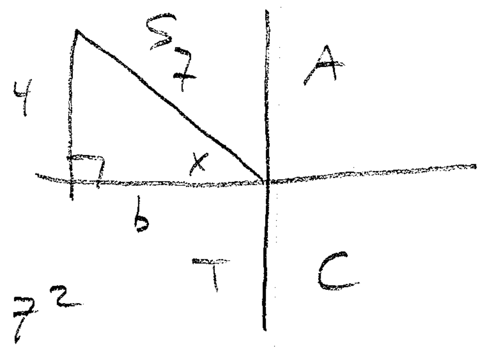
$=\cos(1350^\circ)$

$=\cos(270^\circ)=0$

so $\cos\frac{15\pi}{2}=0$



(2a)

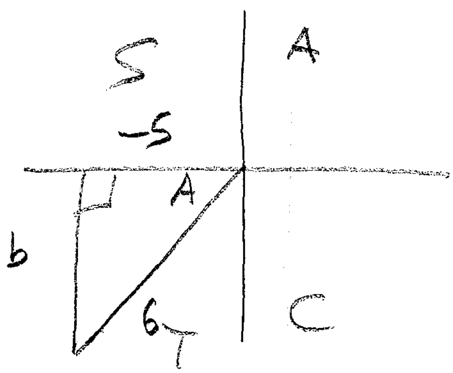


$4^2+b^2=7^2$

$b^2=33$

$b=\pm\sqrt{33} \rightarrow \cos x = \frac{-\sqrt{33}}{7}$

(b)



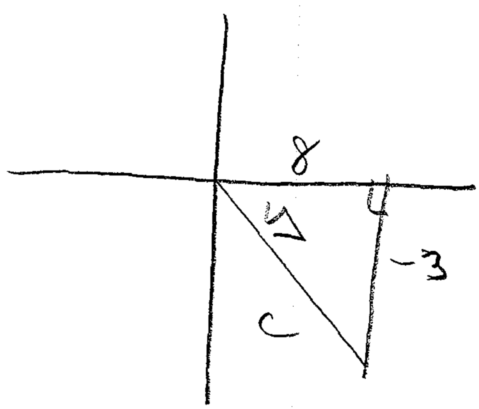
$(-5)^2+b^2=6^2$

$b^2=11$

$b=\pm\sqrt{11}$

$\tan A = \frac{\sqrt{11}}{5}$

(c)



$(-3)^2+8^2=c^2$

$c^2=73$

$c=\sqrt{73}$ (radius is always positive)

$\cos y = \frac{8}{\sqrt{73}}$

3a If $\sin x = \frac{\sqrt{2}}{2}$, then x could equal $\frac{\pi}{4}$ or $3\frac{\pi}{4}$, among others.

Here $0 < x < \pi$, so $x = \frac{\pi}{4}, \frac{3\pi}{4}$

3b If $\sin(2x) = \frac{\sqrt{2}}{2}$, then $2x$ could equal $\frac{\pi}{4}$ or $\frac{3\pi}{4}$, among others

Here $0 < x < \pi$, so $2x = \frac{\pi}{4}, \frac{3\pi}{4} \Rightarrow x = \frac{\pi}{8}, \frac{3\pi}{8}$

But $2x$ could also equal $\frac{9\pi}{4}$, $2x = \frac{9\pi}{4} \Rightarrow x = \frac{9\pi}{8}$ is outside the domain so $x = \frac{\pi}{8}, \frac{3\pi}{8}$

3c Now $\sin(3x) = \frac{\sqrt{2}}{2}$ $3x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{9\pi}{4}, \frac{11\pi}{4}, \frac{17\pi}{4}, \ldots$

so $x = \frac{\pi}{12}, \frac{3\pi}{12}, \frac{9\pi}{12}, \frac{11\pi}{12}$. The next angle, $\frac{17\pi}{12}$ is not in the domain

---

4a $f(x) = \sqrt{x+7}$ Domain is $x+7 \geq 0$ so $x \geq -7$ or $[-7, \infty)$

---

b $f(x) = \frac{\sqrt{x+7}}{x+2}$ Domain is $x+7 \geq 0 \rightarrow x \geq -7$ and $x+2 \neq 0 \rightarrow x \neq -2$

so Domain is $x \geq -7$ and $x \neq -2$

or $[-7, -2) \cup (-2, \infty)$

---

c $f(x) = \frac{\sqrt[3]{x+7}}{x+2}$ Domain is $x+2 \neq 0 \Rightarrow x \neq -2$ or $(-\infty, -2) \cup (-2, \infty)$

Remember that you can take the cube root of a negative number!

(5a) $f(x) = \frac{6x-5}{7}$

$y = \frac{6x-5}{7} \Rightarrow x = \frac{6y-5}{7}$

$7x = 6y-5$

$7x+5 = 6y$

$y = \frac{7x+5}{6} \Rightarrow f^{-1}(x) = \frac{7x+5}{6}$

(b) $f(x) = \frac{\sqrt[3]{6x-5}}{7}$

$y = \frac{\sqrt[3]{6x-5}}{7} \rightarrow x = \frac{\sqrt[3]{6y-5}}{7}$

$7x = \sqrt[3]{6y-5}$

$(7x)^3 = 6y-5$

$(7x)^3+5 = 6y$

$y = \frac{(7x)^3+5}{6} \Rightarrow f^{-1}(x) = \frac{(7x)^3+5}{6}$

(c) $f(x) = \frac{6x-5}{7x+1}$

$y = \frac{6x-5}{7x+1} \rightarrow x = \frac{6y-5}{7y+1}$

$7xy + x = 6y-5$

$7xy - 6y = -x-5$

$y(7x-6) = -x-5$

$y = \frac{-x-5}{7x-6} \rightarrow f^{-1}(x) = \frac{-x-5}{7x-6} = \frac{x+5}{6-7x}$

5d $f(x) = \frac{2-6x}{3+4x}$

$y = \frac{2-6x}{3+4x} \rightarrow x = \frac{2-6y}{3+4y}$

$3x + 4xy = 2 - 6y$

$4xy + 6y = 2 - 3x$

$y(4x+6) = 2 - 3x$

$y = \frac{2-3x}{4x+6} \rightarrow f^{-1}(x) = \frac{2-3x}{4x+6} = \frac{3x-2}{-4x-6}$

6a (i) $g(2) = 2^2 + 9 = 13$ so $f(13) = \frac{1}{13-3} = \frac{1}{10}$

(ii) $f(2) = \frac{1}{2-3} = -1$ so $g(-1) = (-1)^2 + 9 = 10$

(iii) $f(g(x)) = \frac{1}{(x^2+9)-3} = \frac{1}{x^2+6}$

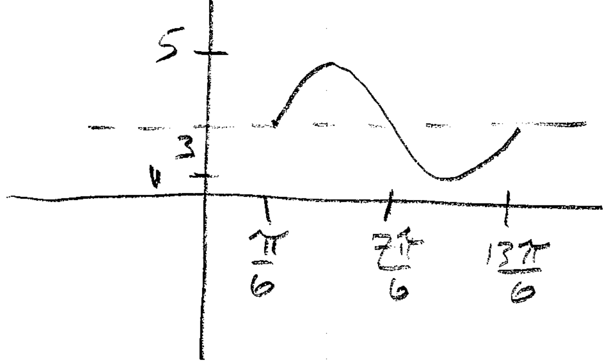
---

b (i) $g(\frac{\pi}{6}) = \sin\frac{\pi}{6} = \frac{1}{2}$ so $f(\frac{1}{2}) = 4(\frac{1}{2}) + \pi = 2 + \pi$

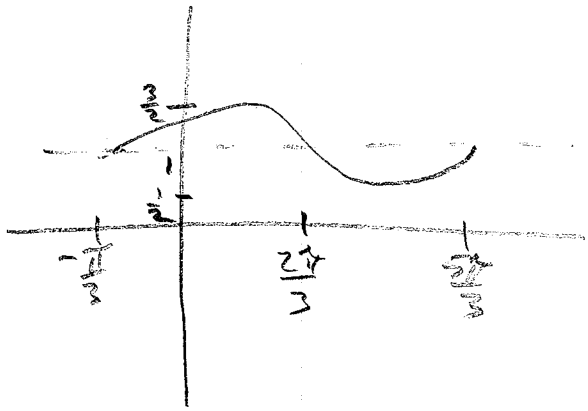
(ii) $f(0) = 4(0) + \pi = \pi$ so $g(\pi) = \sin\pi = 0$

(iii) $f(g(x)) = 4\sin x + \pi$

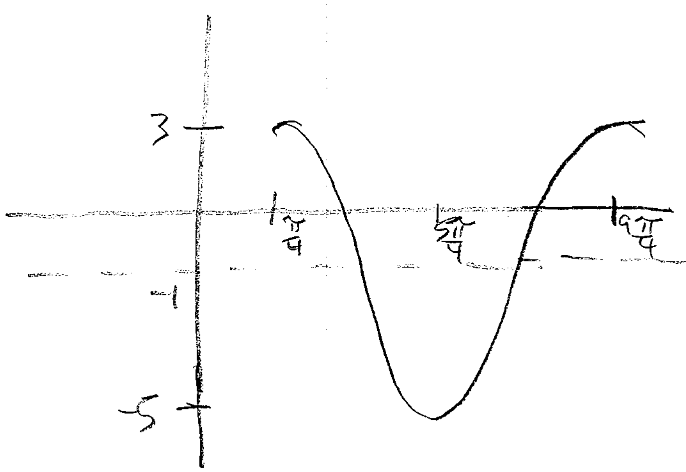
(a)



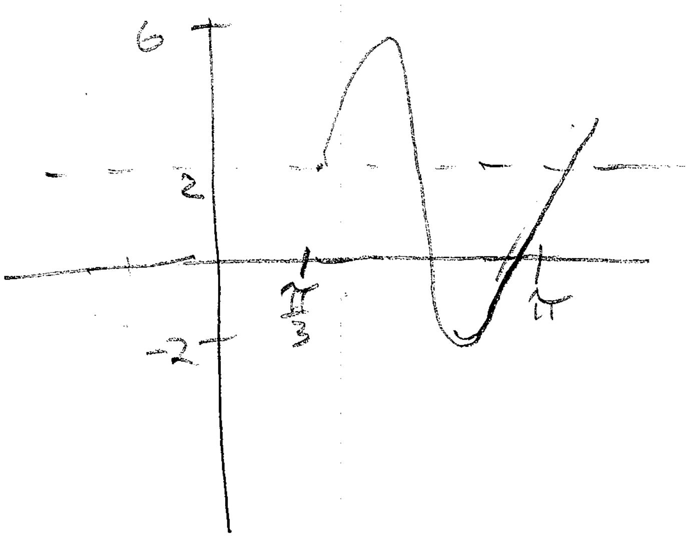
(b)



(c)



(d)



8) a) $5x+2=1 \rightarrow x=-\frac{1}{5}$

$3x+7=1 \rightarrow x=\cancel{-2} \leftarrow$ this value is not ≥ 2 so not a solution

b) $x^3-1=0 \rightarrow x=\cancel{1} \leftarrow$ not <0 so not a solution

$x^3+1=0 \rightarrow x=\cancel{-1} \leftarrow$ not ≥ 0 so not a solution

No solutions

c) $\sqrt[3]{x+1}=0 \rightarrow x=-1$

$x=0$

$\sqrt{x+1}=0 \rightarrow x=\cancel{-1}$ not ≥ 1 so not a solution

---

9) Remember: Rate × Time = Distance

First, Rodrigo drives for 2 hours at 50 mph, so his distance = 50t. After 2 hours, he has traveled 100 miles.
Next, he drives at 30mph so his distance = 30t.
It takes him 2 hours to drive the 60 remaining miles to Priya's house.
After dinner, his distance = 65t for the last 250 − 160 = 90 mi.

$90=65t$

$t=\frac{90}{65}$ hrs.

$$f(t)=\begin{cases} 50t; & 0\leq t<2 \\ 100+30(t-2); & 2\leq t<4 \\ 160; & 4\leq t<5 \\ 160+65(t-5); & 5\leq t<\frac{83}{13} \end{cases}$$

(10) For the first 250 kwh, the cost is \$.24/kwh

$250 \times .24 = \$60$

For the next 500 kwh, the cost is \$.26/kwh

$500 \times .26 = \$130$

$$C(h) = \begin{cases} .24h; & 0 \leq kwh \leq 250 \\ .26(h-250)+60; & 250 \leq kwh \leq 750 \\ .28(h-750)+190; & kwh > 750 \end{cases}$$

For 1100 kwh, $C(1100) = .28(1100-750)+190$

$= \$288$