

Exponents, Inverse, and Composition

① $e^{-3.5x} = 6.7$

$\ln e^{-3.5x} = \ln 6.7$

$-3.5x = \ln 6.7$

$x \approx \frac{\ln 6.7}{-3.5}$

$\{ -0.5435 \}$

② $-4(5^x) = -68$

$5^x = 17$

$\log 5^x = \log 17$

$x = \frac{\log 17}{\log 5}$

$\{ 1.7604 \}$

③ Evaluate

A) $\log_6 \frac{1}{36}$

$6^x = \frac{1}{36}$

$6^x = 6^{-2}$

$\{ -2 \}$

B) $\log_5 100$

$5^x = 100$

$\log 100$
 $\log_5 5$

Change of Base

$\{ 2.8614 \}$

④ $\ln 3 + \frac{1}{3} \ln(4-x^2) - \ln x$

$\ln 3 + \ln(4-x^2)^{1/3} - \ln x$

$\ln 3(4-x^2)^{1/3} - \ln x$

$\ln \frac{3(4-x^2)^{1/3}}{x}$

$\ln \left(\frac{3(4-x^2)^{1/3}}{x} \right)$

⑤ $4 \ln 3x = 15$

$\ln 3x = \frac{15}{4}$

$e^{\ln 3x} = e^{\frac{15}{4}}$

$3x = e^{15/4}$

$x = \frac{e^{15/4}}{3}$

$\{ 14.1737 \}$

6) $f^{-1}(x)$ of $6 + \log_3 2x$

$$y = 6 + \log_3 2x$$

$$x = 6 + \log_3 2y$$

$$x - 6 = \log_3 2y$$

$$3^{x-6} = 2y$$

$$y = \frac{3^{x-6}}{2}$$

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

7) $f^{-1}(x)$ of $y = \sqrt[3]{2x+1} + 1$

$$x = \sqrt[3]{2y+1} + 1$$

$$x - 1 = \sqrt[3]{2y+1}$$

$$(x-1)^3 = 2y+1$$

$$3x-3 = \sqrt[3]{2y+1}$$

$$(3x-3)^3 = 2y+1$$

$$(3x-3)^3 - 1 = 2y$$

$$f^{-1}(x) = \frac{(3(x-1))^3 - 1}{2} \text{ or } \frac{(3x-3)^3 - 1}{2}$$

8) $f(x) = 3x - 5x^2$ $g(x) = 4 - x$

$$[f \circ g](x) = 3(4-x) - 5(4-x)^2$$

$$= 12 - 3x - 5(16 - 8x + x^2)$$

$$= 12 - 3x - 80 + 40x - 5x^2$$

$$[f \circ g](x) = -5x^2 + 37x - 68$$

9) $f(x) = 3 - 2x$ $g(x) = \sqrt{x}$

$$[g \circ f](-2)$$

$$f(-2) = 3 - 2(-2)$$

$$= 3 + 4$$

$$= 7$$

$$[g \circ f](-2) = \sqrt{7}$$

10) $A = P(1 + \frac{r}{n})^{nt}$

$$3600 = 1200(1 + \frac{.09}{4})^{4t}$$

$$3 = (1.0225)^{4t}$$

$$\log 3 = \log 1.0225^{4t}$$

$$\log 3 = 4t \log 1.0225$$

$$t = \frac{\log 3}{4 \log 1.0225}$$

$$t \approx 12.34 \text{ yrs}$$

$$A = Pe^{rt}$$

$$3600 = 1200 e^{.09t}$$

$$3 = e^{.09t}$$

$$\ln 3 = \ln e^{.09t}$$

$$\ln 3 = .09t$$

$$t = \frac{\ln 3}{.09}$$

$$t \approx 12.21 \text{ yrs}$$

Exponents, Inverses, Compositions

(11) $g(x) = \sqrt{x}$ to $g(x) = -\frac{1}{3}\sqrt{x+5} - 6$

- ⊖ = reflects over x-axis
- $\frac{1}{3}$ = vertically compression
- +5 = shifts 5 units left
- 6 = shifts 6 units down

Trigonometry, Inverse Trig, Law of Sines / Cosines

(12) $f(x) = -5\cos\left(\frac{1}{3}x + \frac{\pi}{2}\right)$ $y = a\cos(bx + c) + d$

Amp = 5

Per = $\frac{2\pi}{b}$
 $b = \frac{1}{3}$

Per = $\frac{2\pi}{\frac{1}{3}} = 2\pi \cdot 3 = 6\pi$

Per = 6π

PS = $-\frac{c}{b}$

$c = \frac{\pi}{2}$ $b = \frac{1}{3}$

$c = PS = \frac{(\pi/2)}{1/3}$

left $\frac{3\pi}{2}$

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

(13) $3 + 6\sin(x) = 4 - 5\sin(x)$

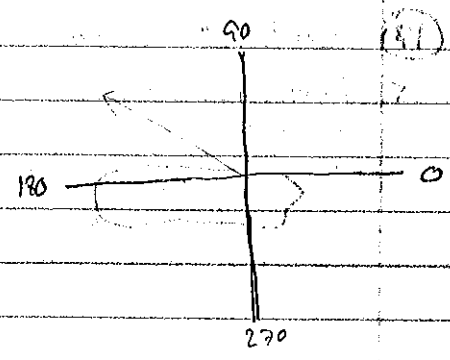
$-1 + 6\sin(x) = -5\sin(x)$
 $-6\sin(x) \quad -6\sin(x)$

$-1 = -11\sin(x)$

$\sin(x) = \frac{1}{11}$

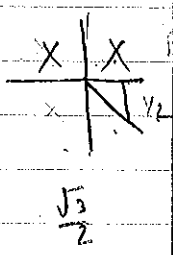
5.22°

$180^\circ - 5.22^\circ = 174.78^\circ$



containing, ...

$\sin \frac{x}{2}$



(14) $\cot(\sin^{-1} \frac{\sqrt{3}}{2})$

$\sin^{-1} \frac{\sqrt{3}}{2}$
 $\sin^{-1} \frac{\sqrt{3}}{2} = 60^\circ$

$\cot 60^\circ$

$\cot 60^\circ = \frac{1/2}{-\sqrt{3}/2} = \frac{1}{2} \cdot \frac{2}{-\sqrt{3}} = -\frac{\sqrt{3}}{3}$

(15) $\cos x = .5683$

$\cos^{-1} .5683 = x$

$x = 55.37^\circ$

containing, ...

(16) A) $\frac{1 - \cos^2 x}{\sin^2 x}$

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

$\sin^2 x + \cos^2 x = 1$

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

1

B) $\sec x - \sin x (\tan x)$

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

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

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

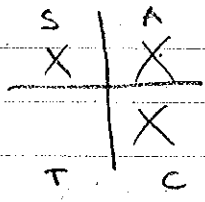
$\frac{\cos^2 x}{\cos x} = \cos x$

(17) $\cot(x) \sin(x) = \cos x$

$\left(\frac{\cos(x)}{\sin(x)} \right) \sin(x) = \cos x$

$\cos x = \cos x$

(18) $\cos x < 0$ and $\tan > 0$



III

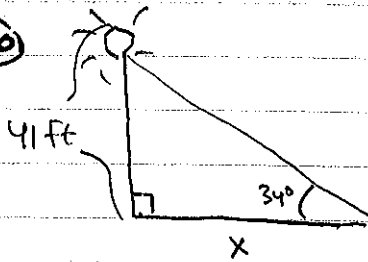
(19) 195°

$195 \times \frac{\pi}{180}$

$\frac{13\pi}{12}$

Trig, Inverse Trig, Law of Sines/Cosines (cont)

(20)

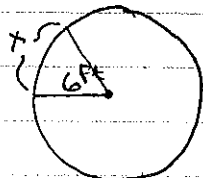


$$\tan 34^\circ = \frac{41}{x}$$

$$x = \frac{41}{\tan 34}$$

$x \approx 60.8 \text{ ft}$

(21)



$$S = \theta r$$

$$S = \frac{\pi \cdot 6}{3}$$

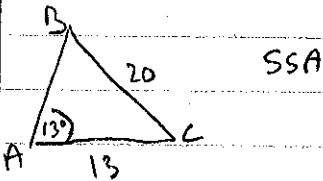
* radians

$$60 \cdot \frac{\pi}{180} = \frac{1\pi}{3}$$

$S = 2\pi$

(22)

A) $a=20$ $b=13$ $A=13$



$$\frac{\sin 13}{20} = \frac{\sin B}{13}$$

$B = 8.41^\circ$

$C = 180 - (8.41 + 13)$

$C = 158.59^\circ$

$$\frac{c}{\sin 158.59} = \frac{20}{\sin 13}$$

$c = 32.45$

$$A = \frac{1}{2} \cdot 13 \cdot 20 \sin 13$$

$A = 29.24 \text{ units}^2$

B) $a=14$ $b=6$ $c=11$ SSS

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$(14)^2 = (6)^2 + (11)^2 - 2(6)(11) \cos A$$

$$196 = 36 + 121 - 132 \cos A$$

$$39 = -132 \cos A$$

$A \approx 107.18^\circ$

$$\frac{\sin 107.18}{14} = \frac{\sin B}{6}$$

$$\sin B = \frac{6 \sin 107.18}{14}$$

$B = 24.17^\circ$

$180 - (107.18 + 24.17)$

$C \approx 48.65$

$$s = \frac{14 + 6 + 11}{2}$$

$s = 15.5$

$$A = \sqrt{15.5(14-15.5)(15.5-6)(15.5-11)}$$

$A \approx 31.5 \text{ units}$