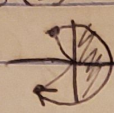
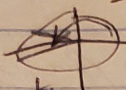


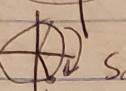
Exam 3

1a. $\log_{81}(\frac{1}{5\sqrt{3}}) \Rightarrow 81^x = \frac{1}{5\sqrt{3}}, 81^{5x} = \frac{1}{125}, 5 \log_{81}(\frac{1}{3}) = x, \boxed{x = -4}$

b. $\log_{125}(5) \Rightarrow 125^x = 5, \boxed{x = \frac{1}{3}}$

2. $r=1$  $(\pi/6) + (\pi/6) + (\pi/4)$ $\frac{12\pi}{12} + \frac{2\pi}{12} + \frac{3\pi}{12} = \boxed{\frac{17\pi}{12}}$

$3a \cos(\frac{-7\pi}{6})$  $= \frac{\sqrt{3}}{2}$

b. $\csc(\frac{-\pi}{3})$  $\sin \rightarrow \frac{\sqrt{3}}{2}, \csc \rightarrow \frac{-2}{\sqrt{3}} \text{ or } \frac{-2\sqrt{3}}{3}$

4. $\csc \theta \cot \theta = \frac{12}{7}, \cos \theta = ?$

$\sin(\frac{\cos \theta}{\sin \theta}) = (\frac{12}{7}) \sin \theta \Rightarrow \cos \theta = \frac{12 \sin \theta}{7}, \sin^2 \theta + \frac{144 \sin^2 \theta}{49} = 1,$
 $49(\frac{144}{49} \sin^2 \theta) = (1 - \sin^2 \theta) 49, 144 \sin^2 \theta = 49 - 49 \sin^2 \theta, \sqrt{195 \sin^2 \theta} = \sqrt{49}$
 $(\cos \theta = \frac{12 \sin \theta}{7})^2 \Rightarrow \cos^2 \theta = \frac{144 \sin^2 \theta}{49} \Rightarrow \cos^2 \theta + \frac{49}{144} \cos^2 \theta = 1,$

$\frac{7 \cos \theta}{12} = \frac{12 \sin \theta}{7} \Rightarrow \cos^2 \theta + \frac{49}{144} \cos^2 \theta = 1,$
 $\frac{144 \cos^2 \theta}{144} + \frac{49 \cos^2 \theta}{144} = \frac{144}{144} \Rightarrow (1 + \frac{49}{144}) \cos^2 \theta = 1$

$49 \cos^2 \theta = 144 - 49 \cos^2 \theta \Rightarrow \sqrt{195 \cos^2 \theta} = \sqrt{144}$
 $\cos \theta = \pm \frac{12}{\sqrt{195}} \text{ or } \frac{12\sqrt{195}}{195}$

$\boxed{\cos \theta = \frac{12}{\sqrt{195}}}$

5. ~~Let~~ $x^2 + y^2 = 1 \Rightarrow (e^{4t})^2 + (e^{2t})^2 = 1 \Rightarrow (e^{4t})(e^{4t}) + (e^{2t})(e^{2t}) = 1$

$\ln(1) + \ln(1) = 4t, 2 \ln(1) = 4t, t = 0.5 \ln 1$

$\log_{10} 10^{4t} = 10 \Rightarrow e^{4t} = 1 - e^{2t} \Rightarrow 1 - \ln(e^{4t}) = 2t, 1 - 4t \ln(e) = 2t, 1 - 4t = 2t$

$\frac{1}{6} = 6t \Rightarrow \boxed{t = \frac{1}{6}}$

6a. $f(x) = 3(2^{7x}), y = \log_6(f(x)) \Rightarrow \log_6(3) + \log_6(2^{7x}) = y \Rightarrow$
 $y = 7x \log_6(2) + \log_6(3) \quad [m = 7 \log_6(2), b = \log_6(3)]$

b. $\log_5(x) + \log_5(x^2 - 2) = 1 \Rightarrow \log_5(x^2 - 2x) = 1 \Rightarrow$

$\frac{5^1}{5} = \frac{x^2 - 2x}{5} \Rightarrow x^2 - 2x - 5 = 0 \quad a=1, b=-2, c=-5$

$\frac{2 \pm \sqrt{4 - 4(1)(-5)}}{2}$

$\frac{2 \pm \sqrt{24}}{2} = x$