PREREQ. PRACTICE PROBS 2 SOLUTIONS

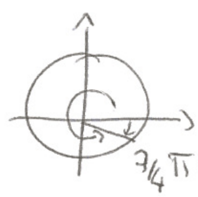
1) $\left(\frac{1}{4}\right)^{-5/2} \cdot \frac{2^3}{3} \left(3^4\right)^{-3/4}$

$$= 4^{5/2} \cdot \frac{2^3}{3} \cdot 3^{-3} = 2^5 \cdot 2^3 \cdot 3^{-3-1} = 2^8 \cdot 3^{-4}$$

2) $\left(\frac{e^2\sqrt{e}}{e^{1/2}}\right)^{-1} = \left(\frac{e^2\cancel{\sqrt{e}}}{\cancel{\sqrt{e}}}\right)^{-1} = e^{-2}$

3) $\sin\left(\frac{7}{8}\pi\right) = \sqrt{\frac{1-\cos\left(\frac{7}{4}\pi\right)}{2}} = \sqrt{\frac{1-\left(+\frac{\sqrt{2}}{2}\right)}{2}} = \sqrt{\frac{2-\sqrt{2}}{4}} = \frac{\sqrt{2-\sqrt{2}}}{2}$

$7/8\pi$



$7/4\pi = -\pi/4$

$\cos\left(\frac{7}{4}\pi\right) = \cos\left(-\pi/4\right) = \cos\left(\pi/4\right) = \frac{\sqrt{2}}{2}$

4) $\sec\left(\frac{3}{2}\pi\right) = \frac{1}{\cos\left(3/2\,\pi\right)}$ not defined

($3/2\,\pi \notin$ domain of secant)

5) $\operatorname{arctg}(1) - \operatorname{arctg}(0) + \arcsin\left(\frac{1}{2}\right) + \arccos(0)$

$$= \pi/4 - 0 + \pi/6 + \pi/2 = \frac{3+2+6}{12}\pi = \frac{11}{12}\pi$$

6) $\ln(3e^3) - \ln(15e) + \ln(25) - \log_3 3^5$

$$= \ln 3 + \ln e^3 - (\ln 15 + \ln e) + \ln(5^2) - 5$$

$$= \ln 3 + 3 - \ln 15 - \ln e + 2\ln 5 - 5$$

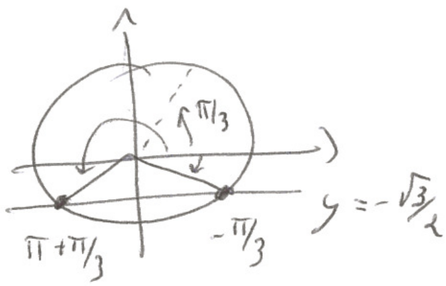
$$= \cancel{\ln 3} + 3 - \ln 5 - \cancel{\ln 3} - 1 + 2\ln 5 - 5$$

$$= -3 + \ln 5$$

7) $e^{-3\ln(x^2)} = \left(e^{\ln(x^2)}\right)^{-3} = (x^2)^{-3} = x^{-6} = \frac{1}{x^6}$

8) $\sin\theta = -\frac{\sqrt{3}}{2}$

In the first quadrant we have $\sin \pi/3 = \sqrt{3}/2$, hence

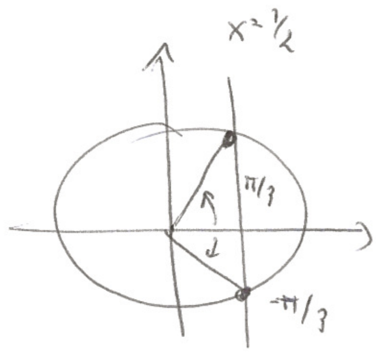


$$\boxed{\begin{array}{ll} \theta = -\pi/3 + 2k\pi & k \in \mathbb{Z} \\ \theta = \frac{4}{3}\pi + 2k\pi & k \in \mathbb{Z} \end{array}}$$

9) $2\cos(5\theta) - 1 = 0$

$\cos(5\theta) = 1/2$

$x = 5\theta \quad \cos(x) = 1/2$



$x = \pi/3 + 2k\pi \quad k \in \mathbb{Z}$

$x = -\pi/3 + 2k\pi \quad k \in \mathbb{Z}$

$$\rightarrow \boxed{\begin{array}{ll} \theta = \pi/15 + \frac{2}{5}k\pi & k \in \mathbb{Z} \\ \theta = -\pi/15 + 2/5\, k\pi & k \in \mathbb{Z} \end{array}}$$

10) $\tan x = 3 \quad \rightarrow \quad \boxed{x = \arctan(3) + k\pi \quad k \in \mathbb{Z}}$

11) $8^x - 16 = 0$

$8^x = 16$

$2^{3x} = 2^4 \Rightarrow 3x = 4 \Rightarrow \boxed{x = 4/3}$

12) $9^x = 3^{x+1} - 1$

$3^{2x} - 3\cdot 3^x + 1 = 0$

$y = 3^x \Rightarrow y^2 - 3y + 1 = 0$

$$y_1, y_2 = \frac{3 \pm \sqrt{9-4}}{2} = \frac{3 \pm \sqrt{5}}{2}$$

$$3^x = \frac{3+\sqrt{5}}{2} \Rightarrow \boxed{x = \log_3\left(\frac{3+\sqrt{5}}{2}\right)}$$

$$3^x = \frac{3-\sqrt{3}}{2} \Rightarrow \boxed{x = \log_3\left(\frac{3-\sqrt{5}}{2}\right)}$$

13) $4^{2x+1} = 7$

$2x + 1 = \log_4 7$

$$\boxed{x = \frac{\log_4 7 - 1}{2}}$$

14) $\ln(3x-1) = -1$

Domain : $3x - 1 > 0 \Rightarrow x > 1/3$

$3x - 1 = e^{-1} \Rightarrow \boxed{x = \frac{e^{-1}+1}{3}}$ ($> 1/3$ so acceptable)

15) $\ln(x^2-4) = 1$

Domain $x^2 - 4 > 0 \Rightarrow x < -2 \cup x > 2$

$x^2 - 4 = e$

$x^2 = 4 + e$

$\boxed{x = \pm\sqrt{4+e}}$ acceptable because $\sqrt{4+e} > \sqrt{4} = 2$

$-\sqrt{4+e} < -\sqrt{4} = -2$

16) $2\ln(x) - \ln(2x-1) = 0$

Domain $x > 0$

$2x - 1 > 0 \rightarrow x > \frac{1}{2}$ $\Big\}$ $x > \frac{1}{2}$

$\ln(x^2) = \ln(2x-1)$

$x^2 = 2x - 1$

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

$(x-1)^2 = 0 \rightarrow \boxed{x = 1}$ acceptable $(> \frac{1}{2})$

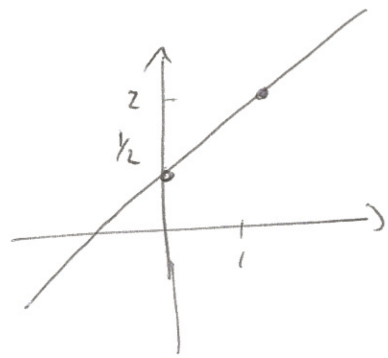
17) $3x - 2y + 1 = 0$

$y = \frac{3}{2}x + \frac{1}{2}$

line

$x = 0 \quad y = \frac{1}{2}$

$x = 1 \quad y = 2$



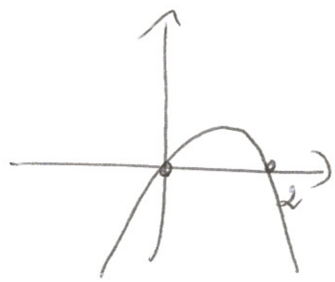
18) $y = -x^2 + 2x$

parabola concave down (sad)

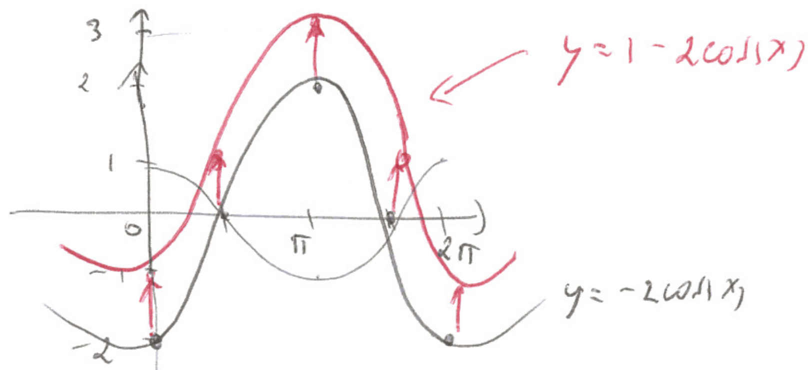
$\cap$ with x-axis $-x^2 + 2x = 0$

$x(-x+2) = 0 \rightarrow x = 0$

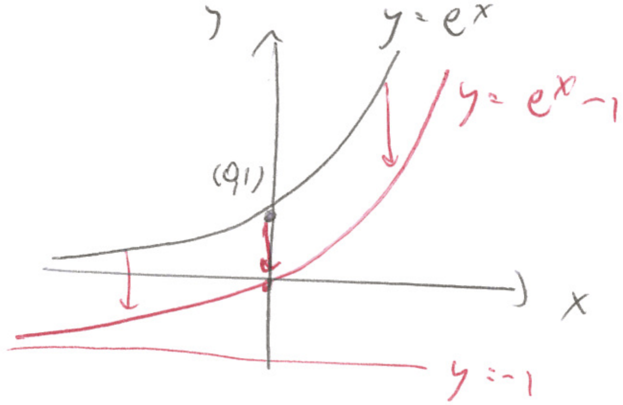
$\rightarrow x = 2$



19) $y = 1 - 2\cos(x)$



20) $y = e^x - 1$



21) $y = -\ln(x-1)$