Trans: THW 5 Wksht: 38-47 | Wksht + 5.7

(38) $\lim_{x\to(\frac{\pi}{2})^-} (x-\frac{\pi}{2})\sec x = \lim_{x\to(\frac{\pi}{2})^-} \frac{x-\frac{\pi}{2}}{\cos x} \underset{LH}{=} \lim_{x\to(\frac{\pi}{2})^-} \frac{1}{-\sin x} = \boxed{-1}$

(39) $\lim_{\theta\to 0} \frac{3^{\sin\theta}-1}{\theta} \underset{LH}{=} \lim_{\theta\to 0} \frac{3^{\sin\theta}\cdot\cos\theta\cdot\ln 3}{1} = \boxed{\ln 3}$

(40) $\lim_{x\to 0} \frac{x2^x}{2^x-1} = \lim_{x\to 0} \frac{x}{1-2^{-x}} \underset{LH}{=} \lim_{x\to 0} \frac{1}{2^x\cdot\ln 2} = \boxed{\frac{1}{\ln 2}}$

(41) $\lim_{x\to 1^+} \left(\frac{1}{x-1}-\frac{1}{\ln x}\right) = \lim_{x\to 1^+} \frac{\ln x-(x-1)}{(x-1)\ln x} \underset{LH}{=} \lim_{x\to 1^+} \frac{\frac{1}{x}-1}{\ln x+\frac{x-1}{x}} = \lim_{x\to 1^+} \frac{1-x}{x\ln x+x-1}$

$\underset{LH}{=} \lim_{x\to 1^+} \frac{-1}{\ln x+1+1} = \boxed{\frac{-1}{2}}$

(42) $\lim_{t\to\infty} \frac{e^t+t^2}{e^t-t} \underset{LH}{=} \lim_{t\to\infty} \frac{e^t+2t}{e^t-1} = \lim_{t\to\infty} \frac{e^t+2}{e^t} = \lim_{t\to\infty} 1 = \boxed{1}$

(43) $\lim_{x\to\infty} (1+2x)^{\frac{1}{2\ln x}}$ Let $y = \lim_{x\to\infty} (1+2x)^{\frac{1}{2\ln x}}$

$\ln y = \ln\left[\lim_{x\to\infty} (1+2x)^{\frac{1}{2\ln x}}\right]$

$\ln y = \lim_{x\to\infty}\left[\ln (1+2x)^{\frac{1}{2\ln x}}\right]$ (because $f(x)=\ln x$ is cont.)

$\ln y = \lim_{x\to\infty}\left[\frac{1}{2\ln x}\cdot\ln(1+2x)\right]$

$\ln y = \lim_{x\to\infty} \frac{\ln(1+2x)}{2\ln x} \underset{LH}{=} \lim_{x\to\infty} \frac{\frac{\cancel{2}\,1}{1+2x}}{\frac{\cancel{2}\,1}{x}} = \lim_{x\to\infty} \frac{x}{1+2x}\cdot\frac{1/x}{1/x}$

$\ln y = \lim_{x\to\infty} \frac{1}{\frac{1}{x}+2} = \frac{1}{2} \to y = \lim_{x\to\infty} (1+2x)^{1/2\ln x} = \boxed{e^{1/2}}$

(44) $\lim_{x\to\infty} \left(\frac{x+2}{x-1}\right)^x$ Let $y = \lim_{x\to\infty} \left(\frac{x+2}{x-1}\right)^x$

$\ln y = \lim_{x\to\infty}\left[x\ln\left(\frac{x+2}{x-1}\right)\right] = \lim_{x\to\infty}\left[\frac{\ln\left(\frac{x+2}{x-1}\right)}{1/x}\right]$, $\lim_{x\to\infty} \ln\left(\frac{x+2}{x-1}\right) = \lim_{x\to\infty} \ln\left(\frac{1+\frac{2}{x}}{1-\frac{1}{x}}\right) = 0$

$\lim_{x\to\infty} \frac{1}{x} = 0$

$\ln y \underset{LH}{=} \lim_{x\to\infty} \frac{\frac{x-1}{x+2}\left(\frac{\overset{-3}{\cancel{(x-1)-(x+2)}}}{(x-1)^3}\right)}{-\frac{1}{x^2}}$

$\ln y = \lim_{x\to\infty} \frac{+3x^2(x-1)}{(x-1)^3} = \lim_{x\to\infty} \frac{3x^3-3x^2}{(x-1)^3} \underset{LH}{=} \lim_{x\to\infty} \frac{9x^2-6x}{3(x-1)^2} = \lim_{x\to\infty} \frac{18x-6}{6(x-1)} = 3$

$\ln y = 3 \to y = \boxed{e^3}$

(45) $\lim_{x\to\infty} \frac{2^x-3^x}{3^x+4^x}\cdot\frac{3^{-x}}{3^{-x}} = \lim_{x\to\infty}\frac{(\frac{2}{3})^x-1}{1+(\frac{4}{3})^x}$ $\lim_{x\to\infty}(\frac{2}{3})^x-1=\infty$; $\lim_{x\to\infty} 1+(\frac{4}{3})^x=\infty$

$$\lim_{x\to\infty}\frac{(\frac{2}{3})^x-1}{1+(\frac{4}{3})^x} \stackrel{LH}{=} \lim_{x\to\infty}\frac{(\frac{2}{3})^x\cdot\ln(\frac{2}{3})}{(\frac{4}{3})^x\cdot\ln(\frac{4}{3})} = \lim_{x\to\infty}\frac{\cancel{(\frac{2}{3})^x}\cdot\ln(\frac{2}{3})}{2^x\cancel{(\frac{2}{3})^x}\cdot\ln(\frac{4}{3})}$$

$$= \lim_{x\to\infty}\frac{\ln(\frac{2}{3})}{2^x\ln(\frac{4}{3})} = \boxed{0}$$

(46) $\lim_{x\to\infty}\frac{e^{x^2}}{xe^x} = \lim_{x\to\infty}\frac{e^{x^2-1}}{x} \stackrel{LH}{=} \lim_{x\to\infty}\frac{e^{x^2-1}\cdot 2x}{1} = \boxed{\infty}$

(47) Let $y=\lim_{k\to\infty}\left(1+\frac{r}{k}\right)^k$

$$\ln y = \lim_{k\to\infty}\ln\left(1+\frac{r}{k}\right)^k = \lim_{k\to\infty} k\ln\left(1+\frac{r}{k}\right) = \lim_{k\to\infty}\frac{\ln(1+\frac{r}{k})}{1/k}$$

$$\ln y = \lim_{k\to\infty}\frac{\ln\left(\frac{k+r}{k}\right)}{\frac{1}{k}} = \lim_{k\to\infty}\frac{\frac{k}{k+r}\left(\frac{k-(k+r)}{k^2}\right)}{-\frac{1}{k^2}} = \lim_{k\to\infty}\frac{+kr}{k+r} = r$$

$$y = e^{1} = \boxed{e^r}$$

5.7 AP

(1) $3y^2dy=\cos x\,dx$
$y^3=\sin x+C$
$1=\frac{1}{2}+C$
$C=\frac{1}{2}$ $\boxed{C}$

(2) $y\,dy=x\,dx$
$y^2=x^2+C$
$1=C$ $\boxed{A}$
$y^2=x^2+1$
$y=\pm1$ $y=\sqrt{x^2+1}$

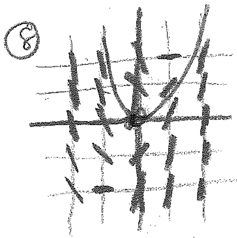
(3) $e^{-y}dy=\cos x\,dx$
$-e^{-y}=\sin x+C$
$-1=0+C$
$e^{-y}=-\sin x+1$
$e^{-y}=\frac{1}{2}$ $\boxed{B}$
$-y=-\ln 2$

(4) $\frac{dy}{y}=x^3dx$
$\ln|y|=\frac{1}{4}x^4+C$
$|y|=e^{\frac{1}{4}x^4+C}$
$|y|=e^C\cdot e^{x^4/4}$
$y=\pm Ce^{x^4/4}$ $\boxed{D}$

(5) $\frac{dy}{y^2}=5dx$
$-y^{-1}=5x+C$
$-1=15+C$
$C=-16$
$y^{-1}=-5x+16$
$y^{-1}=16$ $\boxed{C}$
$y=1/16$

(6) $\frac{dy}{y}=\frac{dx}{1+x^2}$
$\ln|y|=\tan^{-1}(x)+C$
$0=-\frac{\pi}{4}+C$ $\boxed{D}$
$|y|=e^{\tan^{-1}x+\frac{\pi}{4}}$

(7) B

(8)


(9)

x_p	y_p	m	$y=y_p+mh$
0	1	2	$y=1+2(0.1)=1.2$
0.1	1.2	2.5	$y=1.2+2.5(0.1)=1.45$
0.2	1.45		

Wrong Ans.

$f(0.2)\approx\boxed{1.45}$

They found $f(0.3)\approx 1.76$.