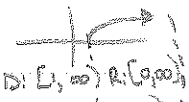
Summer Assignment Answers

(1) $y=\sqrt{x-1}$  D: $[1,\infty)$ R: $[0,\infty)$

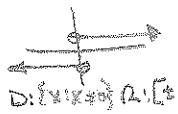
X-INT ($y=0$): $0=\sqrt{x-1}$, $x=1$, $(1,0)$

y-INT ($x=0$): $y=\sqrt{0-1}$, NONE

(2) $y=\sqrt{9-x^2}$  D: $[-3,3]$ R: $[0,3]$

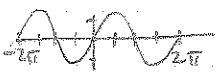
X-INT: $0=\sqrt{9-x^2}$, $(\pm 3,0)$

y-INT: $y=\sqrt{9-0}$, $(0,3)$

(3) $y=\frac{|x|}{x}$  D: $\{x: x\neq 0\}$ R: $\{\pm 1\}$

X-INT: $0=\frac{|x|}{x}$, NONE

y-INT: $y=\frac{|0|}{0}$, NONE

(4) $y=\sin x$  D: $[-2\pi,2\pi]$ R: $[-1,1]$

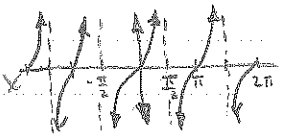
X-INT: $(-2\pi,0);(-\pi,0);(0,0);(\pi,0);(2\pi,0)$

y-INT: $(0,0)$

(5) $y=\cos x$  D: $[-2\pi,2\pi]$ R: $[-1,1]$

X-INT: $(\pm\frac{3\pi}{2},0);(\pm\frac{\pi}{2},0)$

y-INT: $(0,1)$

(6) $y=\tan x$  $K\in$ INTEGERS

X-INT: $(\pm 2\pi,0);(\pm\pi,0);(0,0)$

y-INT: $(0,0)$

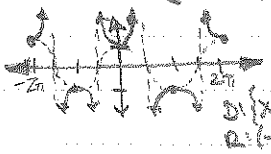
D: $\{x: x\neq \frac{\pi}{2}\pm\pi k\}$ R: $(-\infty,\infty)$

(7) $y=\cot x$  $K\in$ INTEGERS

X-INT: $(\pm\frac{\pi}{2},0);(\pm\frac{3\pi}{2},0)$

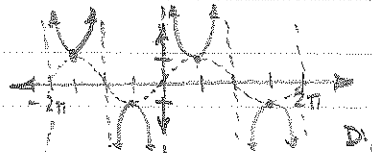
y-INT: NONE

D: $\{x: x\neq \pi\pm\pi k\}$ R: $(-\infty,\infty)$

(8) $y=\sec x$ 

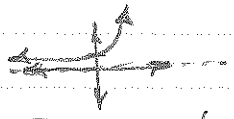
D: $\{x: x\neq \frac{\pi}{2}\pm\pi k\}$ R: $(-\infty,-1]\cup[1,\infty)$

X-INT: NONE y-INT: $(0,1)$

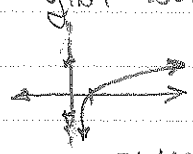
(9) $y=\csc x$ 

D: $\{x: x\neq \pi\pm\pi k\}$ R: $(-\infty,-1]\cup[1,\infty)$

X-INT: NONE y-INT: NONE

(10) $y=e^x$ 

X-INT: NONE y-INT: $(0,1)$

(11) $y=\ln x$ 

X-INT: $(1,0)$ y-INT: NONE

(12) $y=\begin{cases} -1; & x\leq -1 \\ 3x+2; & |x|<1 \\ 7-2x; & x\geq 1 \end{cases}$ 

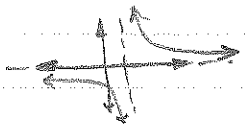
D: $(-\infty,\infty)$

X-INT: $(-\frac{2}{3},0)$ y-INT: $(0,2)$ R: $(-\infty,5]$

(13) $y=\begin{cases} x^2+1; & x>0 \\ -2x+2; & x\leq 0 \end{cases}$ 

X-INT: NONE D: $(-\infty,\infty)$

y-INT: $(0,2)$ R: $(1,\infty)$

(14) $y=\frac{1}{x-1}$ 

HA: $y=0$

VA: $x=1$

Sym: NONE

X-INT: NONE

y-INT: $(0,-1)$

(15) $y=\frac{1}{(x+2)^2}$ 

HA: $y=0$

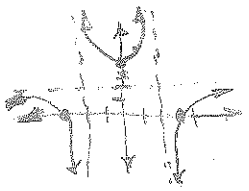
V.A: $x=-2$

Sym: NONE

X-INT: NONE

y-INT: $(0,\frac{1}{4})$

(16) $y = \frac{2(x^2-9)}{x^2-4}$

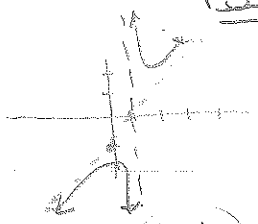


HA: $y=2$
VA: $x=\pm 3$
Sym: yAxis
xint: $(\pm 3, 0)$
yint: $(0, \frac{9}{2})$

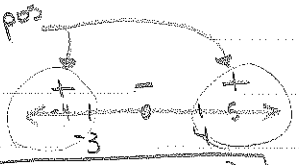
(17) $y = \frac{x^2-2x+4}{x-1}$

S.A: $y = x-1$
V.A: $x=1$
Sym: NONE

$x-1 \overline{)\, x^2-2x+4}$
$x^2 - x$
$-x+4$
$-x+1$
3



(18) $x^2 - x - 12 \geq 0$
$(x-4)(x+3) \geq 0$
$x=4 \quad x=-3$



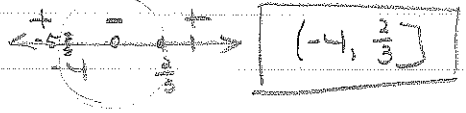
$(-\infty, -3) \cup (4, \infty)$

(19) $(x-2)^2 (x+1)^3 (x-5) \leq 0$
$x=2 \quad x=-1 \quad x=5$ NEG

$[-1, 5]$

(20) $\frac{3x-2}{x+4} \leq 0$ NEG

zeros: $3x-2=0$, $x=\frac{2}{3}$
UND: $x+4=0$, $x=-4$



$(-4, \frac{2}{3}]$

(21) $\frac{(2x+5)(x-1)^2}{(x+2)^3} \geq 0$ pos

zero: $(2x+5)(x-1)^2 = 0$
$x = -\frac{5}{2} \quad x=1$

UND: $(x+2)^3 = 0$
$x=-2$

$(-\infty, -\frac{5}{2}] \cup [-2, \infty)$

(22) $\cos \frac{5\pi}{6} = \boxed{-\frac{\sqrt{3}}{2}}$ (23) $\sin \frac{3\pi}{2} = \boxed{-1}$ (24) $\tan \frac{5\pi}{4} = \boxed{1}$ (25) $\sin \frac{7\pi}{4} = \boxed{-\frac{\sqrt{2}}{2}}$

(26) $\cos \pi = \boxed{-1}$ (27) $\tan \frac{2\pi}{3} = \boxed{-\sqrt{3}}$ (28) $\sec \frac{4\pi}{3} = \boxed{-2}$ (29) $\csc \frac{\pi}{4} = \boxed{\sqrt{2}}$

(30) $\cot \frac{-2\pi}{3} = \boxed{-\frac{\sqrt{3}}{3}}$

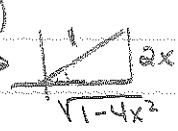
(31) $\tan\left(\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)\right)$ II, I

$\tan\left(\frac{5\pi}{6}\right)$
$\boxed{-\frac{\sqrt{3}}{3}}$

(32) $\sec\left(\arcsin\left(-\frac{\sqrt{2}}{2}\right)\right)$ IV, IV

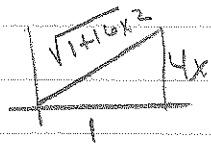
$\sec\left(-\frac{\pi}{4}\right)$
$\boxed{\sqrt{2}}$

(33) $\cos\left(\sin^{-1}(2x)\right)$



cos Δ
$\boxed{\sqrt{1-4x^2}}$

(34) $\sec(\arctan(4x))$



sec Δ
$\boxed{\sqrt{1+16x^2}}$

(35) $2\cos^2 x + 3\cos x - 2 = 0$
$(2\cos x - 1)(\cos x + 2)$

$\cos x = \frac{1}{2}$ $\quad \cos x = -2$
$\boxed{x = \frac{\pi}{3}, \frac{5\pi}{3}}$ $\quad \emptyset$

(36) $2(1-\cos^2 x) - \cos x = 1$
$-2\cos^2 x - \cos x + 2 = 1$
$2\cos^2 x + \cos x - 1 = 0$
$(2\cos x - 1)(\cos x - 1) = 0$

$\cos x = \frac{1}{2}$ $\quad \cos x = 1$
$\boxed{\frac{\pi}{3}, \frac{5\pi}{3}, \pi}$

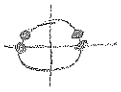
(37) $\sin(2x) = \cos x$

$2\sin x\cos x - \cos x = 0$

$\cos x(2\sin x - 1) = 0$

$\cos x = 0 \quad \sin x = \frac{1}{2}$

$x = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{6}, \frac{5\pi}{6}$



(38) $2\cos(2x) + 1 = 0$

$\cos(2x) = -\frac{1}{2}$

$2x = \frac{2\pi}{3} + 2\pi k \quad 2x = \frac{4\pi}{3} + 2\pi k$

$x = \frac{\pi}{3} + \pi k \quad x = \frac{2\pi}{3} + \pi k$

$x = \frac{\pi}{3}, \frac{4\pi}{3} \quad x = \frac{2\pi}{3}, \frac{5\pi}{3}$

(39) $2\csc^2 x + 3\csc x - 2 = 0$

$(2\csc x - 1)(\csc x + 2) = 0$

$\csc x = \frac{1}{2} \quad \csc x = -2$

$\varnothing \quad \sin x = -\frac{1}{2}$

$x = \frac{7\pi}{6}, \frac{11\pi}{6}$

(40) $(\sec^2 x - 1) - \sec x = 1$

$\sec^2 x - \sec x - 2 = 0$

$(\sec x - 1)(\sec x - 2) = 0$

$\sec x = 1 \quad \sec x = 2$

$\cos x = 1 \quad \cos x = \frac{1}{2}$

$x = 0 \quad x = \frac{\pi}{3}, \frac{5\pi}{3}$

(41) $2\cos\left(\frac{x}{3}\right) - \sqrt{3} = 0$

$\cos\left(\frac{x}{3}\right) = \frac{\sqrt{3}}{2}$

$\frac{x}{3} = \frac{\pi}{6} + 2\pi k \quad \frac{x}{3} = \frac{11\pi}{6} + 2\pi k$

$x = \frac{\pi}{2} + 6\pi k \quad x = \frac{11\pi}{2} + 2\pi k$

$x = \frac{\pi}{2} \quad \varnothing$

(42) $\tan(2x) = -\sqrt{3}$ + "$+\pi$"

$2x = \frac{2\pi}{3} + \pi k$

$x = \frac{\pi}{3} + \frac{\pi}{2}k \quad \frac{2\pi}{6} + \frac{3\pi}{6}$

$x = \frac{\pi}{3}, \frac{5\pi}{6}, \frac{4\pi}{3}, \frac{11\pi}{6}$

(43) $2\sin(3x) - \sqrt{3} = 0$

$\sin(3x) = \frac{\sqrt{3}}{2}$

$3x = \frac{\pi}{3} + 2\pi k \quad 3x = \frac{2\pi}{3} + 2\pi k$

$x = \frac{\pi}{9} + \frac{2\pi}{3}k \quad x = \frac{2\pi}{9} + \frac{2\pi}{3}k$

$x = \frac{\pi}{9}, \frac{7\pi}{9}, \frac{13\pi}{9} \quad x = \frac{2\pi}{9}, \frac{8\pi}{9}, \frac{14\pi}{9}$

(44) $e^{2x+3} = 37$

$\ln e^{2x+3} = \ln 37$

$2x + 3 = \ln 37$

$x = \frac{\ln 37 - 3}{2}$

$x \approx 0.305$

(45) $e^{2x} - 5e^x + 6 = 0$

$(e^x - 2)(e^x - 3) = 0$

$e^x = 2 \quad e^x = 3$

$\ln e^x = \ln 2 \quad \ln e^x = \ln 3$

$x = \ln 2 \quad x = \ln 3$

$x \approx 0.693, 1.099$

(46) $\left(e^x - \frac{12}{e^x} - 1 = 0\right) e^x$

$e^{2x} - e^x - 12 = 0$

$(e^x - 4)(e^x + 3) = 0$

$e^x = 4 \quad e^x = -3$

$x = \ln 4 \quad \varnothing$

$x \approx 1.386$

(47) $44 + 11e^{2x} = 50$

$11e^{2x} = 6$

$e^{2x} = \frac{6}{11}$

$2x = \ln\left(\frac{6}{11}\right)$

$x = \frac{1}{2}\ln\left(\frac{6}{11}\right) \approx$ **-0.303**

(48) $\log_4(x^2 - 3x) = 1$

$4^1 = x^2 - 3x$

$x^2 - 3x - 4 = 0$

$(x - 4)(x + 1) = 0$

$x = -1, 4$

(49) $\ln(5x - 1) = 3$

$e^3 = 5x - 1$

$x = \frac{e^3 + 1}{5} \approx$ **4.217**

(50) $\log_2(x+3)(x-1) = \log_2 12$

$x^2 + 2x - 3 = 12$

$x^2 + 2x - 15 = 0$

$(x + 5)(x - 3) = 0$

MAKES ARGUMENT NEG → ~~$x = -5$~~ **$x = 3$**

(51) $\log_8 \frac{x+5}{x-2} = 1$

$8^1 = \frac{x+5}{x-2}$

$8x - 16 = x + 5$

$7x = 21$

$x = 3$

(52) $\log_6(\log_4(\log_2 x)) = 0$

$6^0 = \log_4(\log_2 x)$

$1 = \log_4(\log_2 x)$

$4^1 = \log_2 x$

$2^4 = x$ ... **$x = 16$**

(53) $\log_3(\log_2(\log_5 25)) = x$

$3^x = \log_2(\log_5 5^2)$

$3^x = \log_2 2^1$

$3^x = 1$ ... **$x = 0$**

(54) $P(t) = \frac{300}{1 + e^{4-t}}$

(a) $P(3) = \frac{300}{1 + e^{4-3}}$

$P(3) =$ **80.682 ppl**

(b) $100 = \frac{300}{1 + e^{4-t}}$

$1 + e^{4-t} = 3$

$e^{4-t} = 2$

$4 - t = \ln 2$

$t = 4 - \ln 2$

$t \approx 3.307$ days

(55) $n = n_0 e^{kt}$ $\quad (0, 500)$ $\quad (1, 1200)$

$500 = n_0 e^{k(0)}$ → $n_0 = 500$

$1200 = 500 e^{k(1)}$

$\frac{12}{5} = e^k$

$k = \ln\left(\frac{12}{5}\right)$

(a) $n = 500 e^{\ln\left(\frac{12}{5}\right)t}$

$n = 500e^{\left[\ln\left(\frac{12}{5}\right)\right](4)}$

$n = 16588.8$ bacteria

(b) $8000 = 500 e^{t \ln \frac{12}{5}}$

$16 = e^{t \ln \frac{12}{5}}$

$t \ln \frac{12}{5} = \ln 16$

$t = \frac{\ln 16}{\ln 12/5} \approx$ **3.167 hr**

(56) 4 (57) 2 (58) ∞ (59) DNE (60) 2 (61) 0

(62) $\lim_{x\to -3} \frac{(x+3)(x-2)}{x+3}$

$\lim_{x\to -3} (x-2) = \boxed{-5}$

(63) $\lim_{x\to 0} \frac{x^2-10x+25-25}{x}$

$\lim_{x\to 0} \frac{x(x-10)}{x}$

$\lim_{x\to 0} (x-10) = \boxed{-10}$

(64) $\lim_{x\to 0} \left(\frac{\sqrt{x+1}-1}{x}\right)\left(\frac{\sqrt{x+1}+1}{\sqrt{x+1}+1}\right)$

$\lim_{x\to 0} \frac{x+1-1}{x(\sqrt{x+1}+1)}$

$\lim_{x\to 0} \frac{x}{x(\sqrt{x+1}+1)} = \lim_{x\to 0} \frac{1}{\sqrt{x+1}+1} = \boxed{\frac{1}{2}}$

(65) $\lim_{x\to -6} \frac{x+6}{(x+6)(x-3)}$

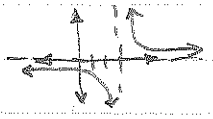
$\lim_{x\to -6} \frac{1}{x-3} = \boxed{-\frac{1}{9}}$

(66) $\lim_{x\to -2} \frac{(x+2)(x^2-2x+4)}{x+2}$

$\lim_{x\to -2} (x^2-2x+4) = \boxed{12}$

(67) $\lim_{x\to\infty} \frac{3x-5x^3}{4x^3+1} = \boxed{-\frac{5}{4}}$

(68) $\lim_{x\to 3^+} \frac{1}{x-3}$



$\boxed{\infty}$

(69) $\lim_{x\to 3^-} \frac{1}{x-3} = \boxed{-\infty}$

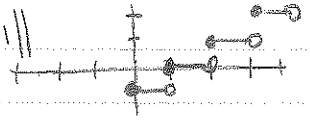
(70) $\lim_{x\to 3} \frac{1}{x-3} = \boxed{\text{DNE}}$

(71) $\lim_{x\to 3} \frac{1}{(x-3)^2}$

$\boxed{\infty \text{ or DNE}}$

(72) $\lim_{x\to 3^+} \|x-1\|$

GREATEST INTEGER FUNCTION



$\boxed{2}$

(73) $\lim_{x\to 3^-} \|x-1\| = \boxed{1}$

(74) $f(x) = \begin{cases} 1-x, & x \le 1 \\ x^2, & x > 1 \end{cases}$

(a) $\lim_{x\to 1^-} f(x) = \boxed{0}$

(b) $\lim_{x\to 1^+} f(x) = \boxed{1}$

(c) $\lim_{x\to 1} f(x) = \boxed{\text{DNE}}$

(75) $f(x) = \begin{cases} \frac{(x-3)(x+2)}{x-3} & , x \neq 3 \\ 4 & , x = 3 \end{cases}$

(a) $\lim_{x \to 3} f(x) = \boxed{5}$

(b) $f(3) = \boxed{4}$

(76) $f'(x) = \lim_{h \to 0} \frac{(x+h)^2 - 8(x+h) - (x^2 - 8x)}{h}$

$\lim_{h \to 0} \frac{x^2 + 2xh + h^2 - 8x - 8h - x^2 + 8x}{h}$

$\lim_{h \to 0} \frac{2xh + h^2 - 8h}{h} \rightarrow \lim_{h \to 0} (2x + h - 8) \rightarrow \boxed{f'(x) = 2x - 8}$

(77) $f'(x) = \lim_{h \to 0} \left[\frac{\sqrt{(x+h)+9} - \sqrt{x+9}}{h} \right] \cdot \frac{\sqrt{x+h+9} + \sqrt{x+9}}{\sqrt{x+h+9} + \sqrt{x+9}}$

$\lim_{h \to 0} \frac{x+h+9 - (x+9)}{h\left[\sqrt{x+h+9} + \sqrt{x+9}\right]}$

$\lim_{h \to 0} \frac{h}{h\left[\sqrt{x+h+9} + \sqrt{x+9}\right]} \rightarrow \lim_{h \to 0} \frac{1}{\sqrt{x+h+9} + \sqrt{x+9}} = \boxed{\frac{1}{2\sqrt{x+9}}}$

(78) $f'(x) = \lim_{h \to 0} \left[\frac{\frac{3}{x+h-4} - \frac{3}{x-4}}{h} \right] \frac{(x+h-4)(x-4)}{(x+h-4)(x-4)}$

$\lim_{h \to 0} \frac{3x - 12 - (3x + 3h - 12)}{h(x+h-4)(x-4)}$

$\lim_{h \to 0} \frac{-3h}{h(x+h-4)(x-4)} \rightarrow \lim_{h \to 0} \frac{-3}{(x+h-4)(x-4)} \rightarrow f'(x) = \boxed{\frac{-3}{(x-4)^2}}$

(79) $\lim_{h \to 0} \frac{(x+h)^3 + 2(x+h)^2 - (x+h) + 4 - (x^3 + 2x^2 - x + 4)}{h}$

$\lim_{h \to 0} \frac{x^3 + 3x^2h + 3xh^2 + h^3 + 2x^2 + 4xh + 2h^2 - x - h + 4 - x^3 - 2x^2 + x - 4}{h}$

$\lim_{h \to 0} \frac{3x^2h + 3xh^2 + h^3 + 4xh + 2h^2 - h}{h}$

$\lim_{h \to 0} (3x^2 + 3xh + h^2 + 4x + 2h - 1) \rightarrow \boxed{f'(x) = 3x^2 + 4x - 1}$

(80) $f(x) = 3x^4 - 5x^3 + 2x^{-1} + 6x^{\frac{1}{3}} - 12$

$\boxed{f'(x) = 12x^3 - 15x^2 - 2x^{-2} + 4x^{-\frac{1}{3}}}$

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

$f(x) = 2x - 3 + x^{-1}$

$\boxed{f'(x) = 2 - x^{-2}}$

(82) $f(x) = x^{\frac{1}{2}} + x^{\frac{1}{3}}$

$\boxed{f'(x) = \frac{1}{2}x^{-\frac{1}{2}} + \frac{1}{3}x^{-\frac{2}{3}}}$

(83) $f(x) = (6x+5)(x^2-2)$

$f(x) = 6x^4 + 5x^3 - 12x - 10$

$\boxed{f'(x) = 24x^3 + 15x^2 - 12}$

(84) $f(x) = \frac{x^3}{x^2} + \frac{5x}{x^2} - \frac{3}{x^2}$

$f(x) = x + 5x^{-1} - 3x^{-2}$

$\boxed{f(x) = 1 - 5x^{-2} + 6x^{-3}}$

(85) (a) $f'(x) = 4x^3 - 6x$

(b) Need slope + pt $(1, 5)$

$m = f'(1) = 4(1)^3 - 6(1)$

$m = -2$ . . . . $\boxed{y - 5 = -2(x-1)}$