HW #3

1.5

#15 $z = 3\cos(u/4) + 5$, max. value of $z = 8$, min " $z = 2$ } Amplitude = 3

period of z = period of $\cos(u/4) = \dfrac{2\pi}{\frac{1}{4}} = 8\pi$

#36 1 revolution = 360° = 2π radians $\Longrightarrow$ 200 rev. = 400π radians
500 rev = 1000π radians

1 minute = 60 seconds

$\Longrightarrow$ $200 \text{ rev.}/1\text{ min} = 400\pi \text{ rad}/60\text{ sec} = \frac{20}{3}\pi$ rad per sec.

$\Longrightarrow$ $500 \text{ rev}/1\text{min} = 1000\pi \text{ rad}/60\text{ sec} = \frac{50}{3}\pi$ rad per sec.

#41 Amplitude = $2|A| = 15 \rightarrow |A| = 15/2 = 7.5$

a) D = average water level

b) $|A| = 7.5 \Rightarrow A = \mp 7.5$ but high tide is at midnight $\rightarrow A = 7.5$

c) period of y = period of $\cos[B(t-C)] \doteq$ period of $\cos[Bt]$

$\hookrightarrow$ ($t - C \rightarrow t$ shifts the function to the left)

$12.4 = \dfrac{2\pi}{B} \Rightarrow \boxed{B = \dfrac{2\pi}{12.4}}$

d) C is the time of high tide

HW#3

1.6

#3 a) $\lim_{x\to\infty} x^7 = \infty$

b) $\lim_{x\to\infty} 3x + 7x^3 - 12x^4 = \infty$

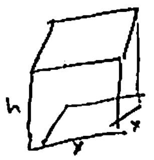
c) $\lim_{x\to\infty} x^{-4} = \lim_{x\to\infty} \frac{1}{x^4} = 0$

d) $\lim_{x\to\infty} \frac{6x^3 - 5x^2 + 2}{x^3 - 8} = \lim_{x\to\infty} \frac{\frac{6x^3}{x^3} - \frac{5x^2}{x^3} + \frac{2}{x^3}}{\frac{x^3}{x^3} - \frac{8}{x^3}} = \lim_{x\to\infty} \frac{6 - \frac{5}{x} + \frac{2}{x^3}}{1 - \frac{8}{x^3}}$

$= \frac{6 - 0 + 0}{1 - 0}$

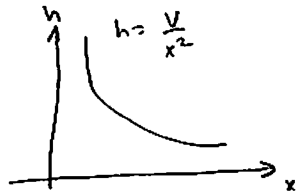
$= \boxed{6}$

#15



$V = x \cdot x\, h$

$V = x^2 h \Rightarrow \boxed{h = \frac{V}{x^2}}$



#19 a) $t = 0 \Rightarrow s = 0 - 0 = 0$

b) $s = 0 \Rightarrow 0 = v_0 t - \frac{g}{2} t^2$

$\Rightarrow 0 = t\left(v_0 - \frac{g}{2} t\right)$

$\Rightarrow t = 0$ or $v_0 - \frac{g}{2} t = 0$

$\Downarrow$ initial time

$\Downarrow$ $v_0 = \frac{g}{2} t$

$\Downarrow$ $\boxed{t = \frac{2 v_0}{g}}$

c) $s(t) = -\frac{g}{2} t^2 + v_0 t$

$= -\left[\sqrt{\frac{g}{2}}\, t - \frac{v_0}{\sqrt{2g}}\right]^2 + \frac{v_0^2}{2g}$

s = heighest when $\sqrt{\frac{g}{2}}\, t - \frac{v_0}{\sqrt{2g}} = 0$

$\sqrt{\frac{g}{2}}\, t = \frac{v_0}{\sqrt{2g}}$

$\boxed{t = \frac{v_0}{g}}$

d) $s\left(\frac{v_0}{g}\right) = -\frac{g}{2}\left(\frac{v_0}{g}\right)^2 + v_0\left(\frac{v_0}{g}\right)$

$= -\frac{v_0^2}{2g} + \frac{v_0^2}{g} = \boxed{\frac{v_0^2}{2g}}$

#21 (i) $f(1) = 1 \Rightarrow a + b + c = 1$

(ii) $1 = \frac{-b}{2a} \rightarrow b = -2a$

(iii) $\boxed{c = 6}$

$\Rightarrow a + b + 6 = 1$, $\boxed{a + b = -5}$ but $b = -2a$ so $a - 2a = -5$

$-a = -5$

$\boxed{a = 5} \rightarrow b = -2 \cdot 5$, $\boxed{b = -10}$

b) $f(x) = 5x^2 - 10x + 6$

1.7

$\boxed{\#8}$ $\frac{1}{\sin x}$ not continuous at 0.

$\boxed{\#12}$ $f(x) = e^x - 3x$

$\left.\begin{array}{l} f(0) = e^0 - 0 = 1 > 0 \\ f(1) = e - 3 \quad < 0 \end{array}\right\}$ by IVT there exists c between 0 & 1 st $f(c) = 0$

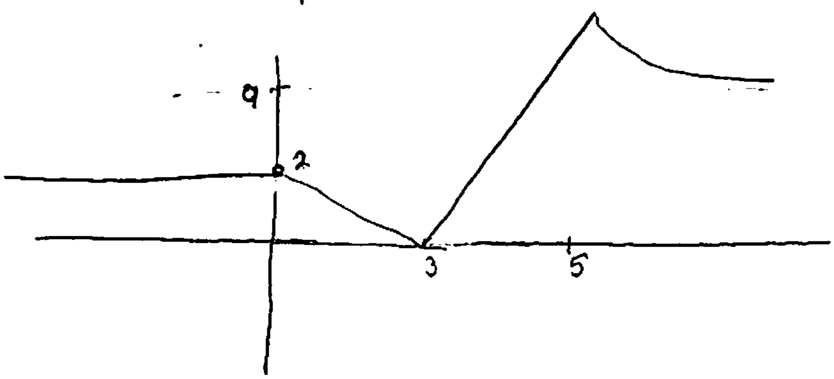
$\boxed{\#20}$ $\lim_{x\to 2^-} f(x) = \lim_{x\to 2^+} f(x) = f(2)$ [function is obviously cont. at other points]

$\downarrow$

$2k = 3\cdot 2^2 = 3\cdot 2^2$

$2k = 12 \Rightarrow \boxed{k=6}$

$\boxed{\#28}$ a)



b) If it is concave down $\Rightarrow$ 

but it is decreasing for $x > 6$ $\rightarrow$  $\Rightarrow \lim_{x\to\infty} f(x) = -\infty$