Amplitude:

$$\boxed{\text{Amplitude} = 3}$$

Period:

$$\text{Period} = \left|\frac{2\pi}{B}\right|$$

$$= \left|\frac{2\pi}{2}\right|$$

$$\boxed{\text{Period} = \pi}$$

Phase Shift:

$$\text{Phase Shift} = -\frac{C}{B}$$

$$\boxed{\text{Phase Shift} = -\frac{\pi}{2}}$$

Start of the wave:

$$\text{Phase Shift} = \boxed{\frac{-\pi}{2}}$$

End of the wave:

Phase Shift + Period

$$= \frac{-\pi}{2} + \frac{\pi}{1}$$

$$= \frac{-\pi + 2\pi}{2}$$

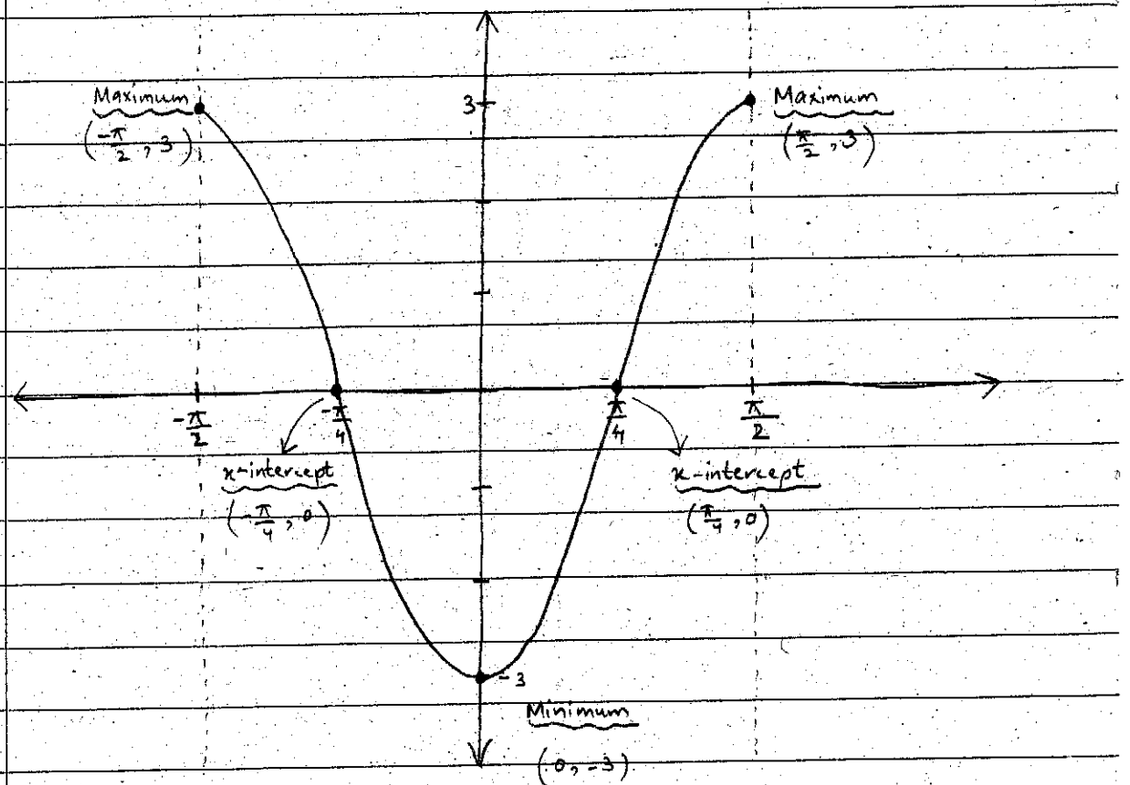
$$= \boxed{\frac{\pi}{2}}$$

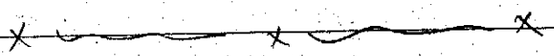
R.W

$-\frac{\pi}{2} + \frac{\pi}{1}$

$\frac{-\pi + 2\pi}{2}$

$\frac{\pi}{2}$





(b) $y = 2 \sin(4x - \pi)$

Amplitude:

$$\boxed{A = 2}$$

Period:

$$P = \left| \frac{2\pi}{B} \right|$$

$$P = \left| \frac{2\pi}{4} \right|$$

$$\boxed{P = \frac{\pi}{2}}$$

Phase Shift:

$$P.S. = \frac{-C}{B}$$

$$= \frac{-(-\pi)}{4}$$

$$\boxed{P.S. = \frac{\pi}{4}}$$

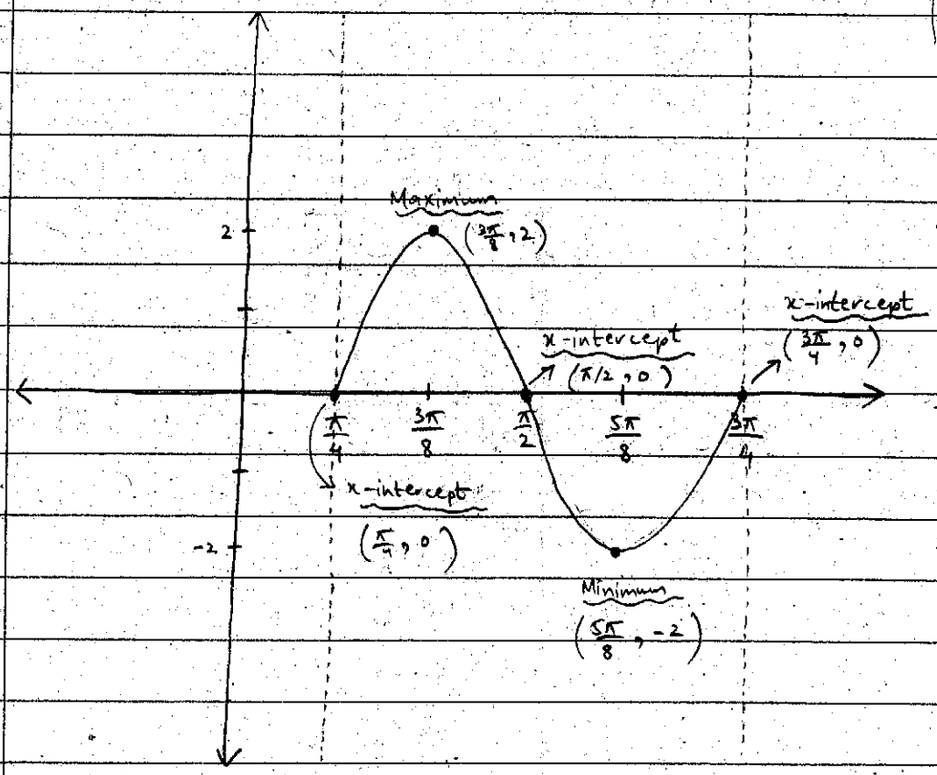
Start of the wave:

Phase Shift = $\boxed{\frac{\pi}{4}}$

End of the wave:

Phase Shift + Period = $\frac{\pi}{4} + \frac{\pi}{2}$

= $\boxed{\frac{3\pi}{4}}$



(c) $y = -4 \sin\left(x - \frac{\pi}{2}\right)$

Amplitude:

$$\boxed{A = -4}$$

Period:

$$P = \left| \frac{2\pi}{B} \right|$$

$$P = \left| \frac{2\pi}{1} \right|$$

$$\boxed{P = 2\pi}$$

Phase Shift:

$$P.S. = -\frac{C}{B}$$

$$= -\frac{(-\pi/2)}{1}$$

$$\boxed{P.S. = \frac{\pi}{2}}$$

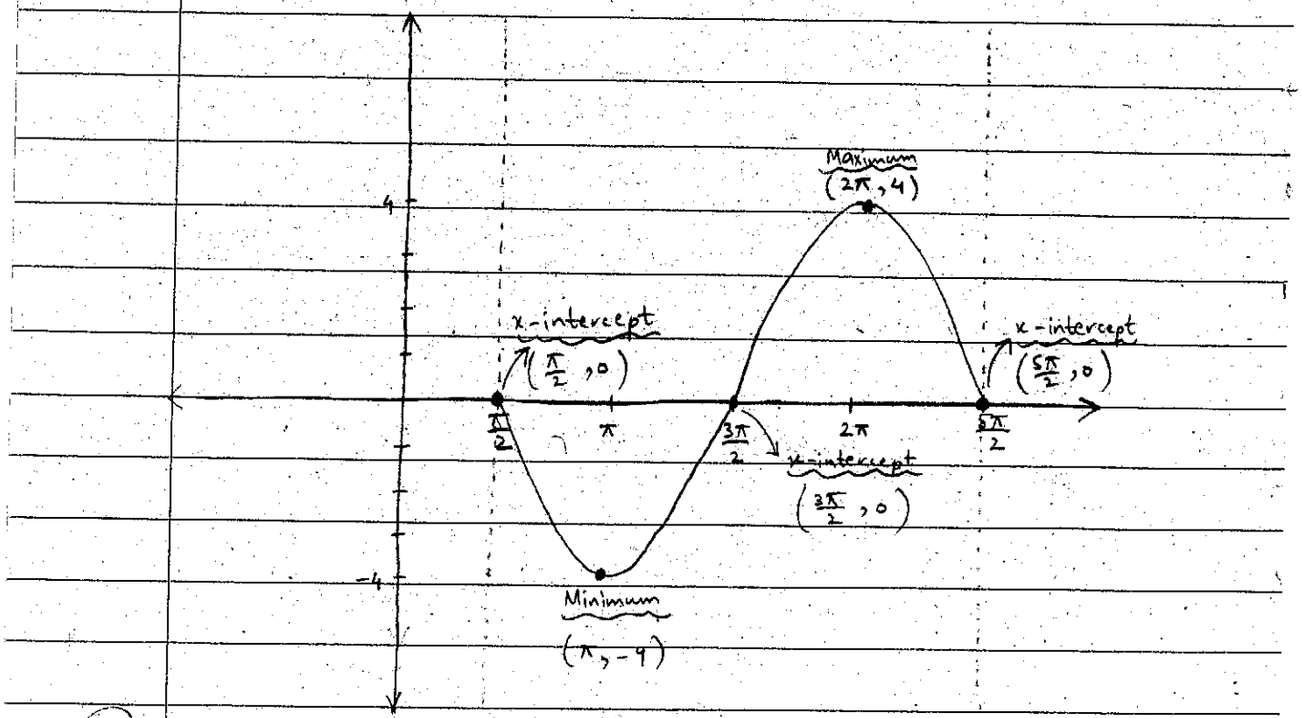
Start of the wave:

Phase Shift = $\boxed{\frac{\pi}{2}}$

End of the wave:

Phase Shift + Period = $\frac{\pi}{2} + 2\pi$

$= \boxed{\frac{5\pi}{2}}$



P.ω

$\frac{\pi}{6}$

$\frac{6\pi - \pi}{6}$

$\frac{5\pi}{6}$

(*) QUESTION 11:

(a) $2\sin^2 x = \sin x$

$2\sin^2(x) - \sin(x) = 0$

$\sin(x)\{2\sin(x) - 1\} = 0$

$\sin(x) = 0 \quad , \quad 2\sin(x) - 1 = 0$

$x = \sin^{-1}(0) \quad , \quad x = \sin^{-1}\left(\frac{1}{2}\right)$

$x = (\pi - 0) + 2\pi n \quad , \quad x = \left(\pi - \frac{\pi}{6}\right) + 2\pi n$

$\boxed{x = \pi + 2\pi n}$, $\boxed{x = \frac{5\pi}{6} + 2\pi n}$

where $n = 0, \pm 1, \pm 2, \ldots$, where $n = 0, \pm 1, \pm 2, \ldots$

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

Let $\cos(x) = a$

$2a^2 - a - 1 = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(2)(-1)}}{2(2)}$

$$x = \frac{1 \pm \sqrt{1+8}}{4}$$

$$x = \frac{1 \pm \sqrt{9}}{4}$$

$$x = \frac{1 \pm 3}{4}$$

$$x = \frac{1+3}{4} \quad , \quad x = \frac{1-3}{4}$$

$$x = \frac{4}{4} \quad , \quad x = -\frac{2}{4}$$

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

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

$$x = \cos^{-1}(1) \quad , \quad x = \cos^{-1}\left(-\frac{1}{2}\right)$$

$$\boxed{x = \pm \pi + 2\pi n} \quad , \quad \boxed{x = \pm \frac{2\pi}{3} + 2\pi n}$$

where $n = 0, \pm 1, \pm 2, \ldots$

(c) $\tan^2 x - \tan x = 0$

$\tan(x)\{\tan(x) - 1\} = 0$

$\tan(x) = 0 \quad , \quad \tan(x) - 1 = 0$

$x = \tan^{-1}(0) \quad , \quad x = \tan^{-1}(1)$

$\boxed{x = \pi + \pi n} \quad , \quad \boxed{x = \frac{\pi}{4} + \pi n}$

where $n = 0, \pm 1, \pm 2, \ldots$

(*) QUESTION 12:

(a) $f(t) = 10,000\,(1 - 0.015)^t$

$f(t) = 10,000\,(0.985)^t$

$f(5) = 10,000\,(0.985)^5$

$\boxed{f(5) = 9272}$ The population will be approximately 9272 after 5 years.

(b) $5,000 = 10,000\,(0.985)^t$

~~$5,000$~~ $= ~~10,000~~\,(0.985)^t$

~~$2 \cdot 10,000$~~ ~~$10,000$~~

$\frac{1}{2} = (0.985)^t$

$\ln\left(\frac{1}{2}\right) = \ln(0.985)^t$

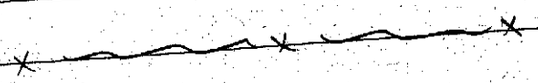
$$\ln\left(\frac{1}{2}\right) = t \ln(0.985)$$

$$t = \frac{\ln(1/2)}{\ln(0.985)}$$

$$t = 45.86236$$

$$1998 + 45 = \boxed{2043}$$

In 2043, there will be half of the population left



(*) QUESTION 13:

(a) $f(t) = 80,000(1 + 0.04)^t$

$f(t) = 80,000(1.04)^t$

$f(12) = 80,000(1.04)^{12}$

$\boxed{f(12) = 128,083}$

The population will be approximately 128,083 in 2015.

(b) $240,000 = 80,000\,(1.04)^t$

$\frac{240,000}{80,000} = \frac{80,000}{80,000}(1.04)^t$

$3 = (1.04)^t$

$\ln(3) = \ln(1.04)^t$

$\ln(3) = t\ln(1.04)$

$t = \frac{\ln(3)}{\ln(1.04)}$

$t = 28.011022\,76$

$2003 + 28 = \boxed{2031}$

The population will be tripled in 2031.

(*) QUESTION 14:

(a) $y = 3 - 4x$

$x = 3 - 4y$

$x + 4y = 3$

$\frac{4y}{4} = \frac{3-x}{4}$

$$y = \frac{3-x}{4}$$

$$\boxed{f^{-1} = \frac{3-x}{4}} \text{ Ans.}$$

(b) $$y = \frac{4}{x-3}$$

$$x = \frac{4}{y-3}$$

$$x(y-3) = 4$$

$$xy - 3x = 4$$

$$\frac{xy}{x} = \frac{4+3x}{x}$$

$$y = \frac{4+3x}{x}$$

$$\boxed{f^{-1} = \frac{4+3x}{x}} \text{ Ans.}$$

(c) $y = \frac{2}{8x+5}$

$x = \frac{2}{8y+5}$

$x(8y+5) = 2$

$8xy + 5x = 2$

$\frac{8xy}{8x} = \frac{2-5x}{8x}$

$y = \frac{2-5x}{8x}$

$\boxed{f^{-1} = \frac{2-5x}{8x}}$ Ans.

x ~~~ x ~~~ x

(d) $y = \frac{x-1}{x+2}$

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

$(x)(y+2) = y - 1$

$xy + 2x = y - 1$

$xy = -1 - 2x + y$

$xy - y = -1 - 2x$

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

$y = \frac{-2x-1}{x-1}$

$\boxed{f^{-1} = \frac{-2x-1}{x-1}}$ Ans.

(*) QUESTION 15:

(a) 22, 19, 16, 13, ...

$a_1 = 22$

$d = -3$

$a_n = a_1 + d(n-1)$

$a_{70} = 22 - 3(70-1)$

(47)

$a_{70} = 22 - 3(69)$