(10 pts) $f(x) = \begin{cases} 8 - x & \text{for} \quad x < 4 \\ x^2 - x & \text{for} \quad x \geq 4 \end{cases}$

(a) Determine $f(4)$ $f(4) = (4)^2 - 4 = 12$

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

(c) Complete the definition (using limits): f is **continuous** at $x = a$ if

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

(d) Using the definition in (c), explain carefully why $f(x)$ is not continuous at $x = 4$.

note that $\lim_{x \to 4^-} f(x) = \lim_{x \to 4^-} (8 - x) = 4 \neq \lim_{x \to 4^+} f(x)$

so the limit as $x \to 4$ of $f(x)$ does not exist.

(5 pts) The depth of water at a particular point in a bay is given by the function $y = 20 + 8\cos(t/2)$, where y is in feet and t is time in hours since midnight.

(a) What is the amplitude?

amplitude = 8

(b) Find the period for this function..

4π : $\frac{2\pi}{\text{period}} = \frac{1}{2} \Rightarrow$ period $= 4\pi$

(c) What is the depth of the water at low tide?

depth @ low tide $= 20 - 8 = 12$

(d) Give one time when tide occurs.

high tide: $t = 0$, $t = 4\pi$, $t = 8\pi$ etc.

low tide: $t = 2\pi$, $t = 6\pi$, etc.