1a) $\lim_{x\to -3}\left(x^2 + 3x\right)$

$= (-3)^2 + 3(-3)$

$= 9 - 9 = 0$

1b) $\lim_{x\to -4}(x + 3)^2$

1c) $\lim_{x\to 7}\frac{3x}{\sqrt{x + 2}}$

2a) $\lim_{x\to 2}\frac{x^3 - 8}{x - 2}$

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

$= \lim_{x\to 2}\left(x^2+2x+4\right)$

$= \left((2)^2+2\bullet(2)+4\right)$

$= 12$

2b) $\lim_{x\to -3}\frac{x^2 + x - 6}{x^2 - 9}$

2c) $\lim_{x\to \pi/4}\frac{1 - \tan x}{\sin x - \cos x}$

3a) $\lim_{x\to 0}\frac{\sqrt{x + 5} - \sqrt{5}}{x}$

$= \lim_{x\to 0}\frac{\sqrt{x + 5} - \sqrt{5}}{x}\cdot\frac{\sqrt{x + 5} + \sqrt{5}}{\sqrt{x + 5} + \sqrt{5}}$

$= \lim_{x\to 0}\frac{(x + 5) - 5}{x\left(\sqrt{x + 5} + \sqrt{5}\right)}$

$= \lim_{x\to 0}\frac{1}{\sqrt{x + 5} + \sqrt{5}}$

$= \frac{1}{2\sqrt{5}} = \frac{\sqrt{5}}{10}$

3b) $\lim_{x\to 4}\frac{\sqrt{x + 5} - 3}{x - 4}$

4a) $\lim_{x \to 0} \frac{[1/(3+x)] - (1/3)}{x}$

$= \lim_{x \to 0} \frac{\frac{1}{3+x} - \frac{1}{3}}{x}$

$= \lim_{x \to 0} \frac{3 - (3+x)}{(3+x)3(x)}$

$= \lim_{x \to 0} \frac{-x}{(3+x)(3)(x)}$

$= \lim_{x \to 0} \frac{-1}{(3+x)3} = -\frac{1}{9}$

4b) $\lim_{x \to 0} \frac{[1/(2+x)] - (1/2)}{x}$

5a) $\lim_{\Delta x \to 0} \frac{2(x + \Delta x) - 2x}{\Delta x}$

$= \lim_{\Delta x \to 0} \frac{2x + 2\Delta x - 2x}{\Delta x}$

$= \lim_{\Delta x \to 0} 2 = 2$

5b) $\lim_{\Delta x \to 0} \frac{(x + \Delta x)^2 - 2(x + \Delta x) + 1 - (x^2 - 2x + 1)}{\Delta x}$

6a) $\lim_{x \to 1} \cos \frac{\pi x}{3}$

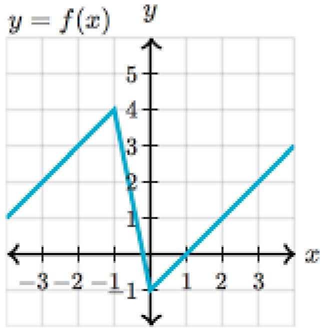
$= \cos \frac{\pi}{3} = \frac{1}{2}$

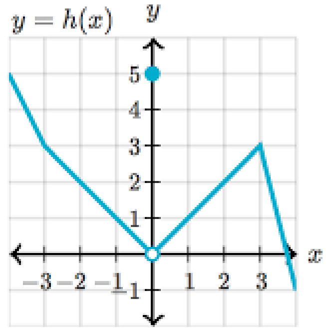
6b) $\lim_{x \to 0} \sec 2x$

6c) $\lim_{x \to 3} \tan\left(\frac{\pi x}{4}\right)$

6d) $\lim_{x \to 2} \cot\left(\frac{3\pi}{2} x\right)$

Use the graphs below to find the following limits(if they exist)





7a) $\lim_{x\to 0} f(h(x))$

$= f\left(\lim_{x\to 0}(h(x))\right)$

$= f(0)$

$= -1$

7b) $\lim_{x\to 0}\left[2f(x) - \dfrac{h(x)}{f(x)}\right]$

$= \lim_{x\to 0} 2f(x) - \lim_{x\to 0}\dfrac{h(x)}{f(x)}$

$= 2\lim_{x\to 0} f(x) - \dfrac{\lim_{x\to 0} h(x)}{\lim_{x\to 0} f(x)}$

$= 2\bullet(-1) - \dfrac{0}{-1}$

$= -2$

7c) $\lim_{x\to 0} h(f(x))$

7d) $\lim_{x\to -1} f(x)\bullet 3h(x)$

7e) $\lim_{x\to 2}\left[f(2h(x)) + h(3f(x))\right]$

8) AP MULTIPLE CHOICE EXAMPLES

1) $\lim_{x \to \frac{\pi}{6}} \sec^2 x =$

(A) $\frac{3}{4}$ (B) $\frac{\sqrt{3}}{2}$ (C) $\frac{4}{3}$ (D) $\frac{2\sqrt{3}}{3}$

2) If $f(x) = \begin{cases} x^2 + 3, & x \neq 1 \\ 1, & x = 1 \end{cases}$, then $\lim_{x \to 1} f(x) =$

(A) 1 (B) 2 (C) 3 (D) 4

3) Let f be a function given by $f(x) = \begin{cases} 3 - x^2, & \text{if } x < 0 \\ 2 - x, & \text{if } 0 \le x < 2 \\ \sqrt{x-2}, & \text{if } x > 2 \end{cases}$.

Which of the following statements are true about f ?

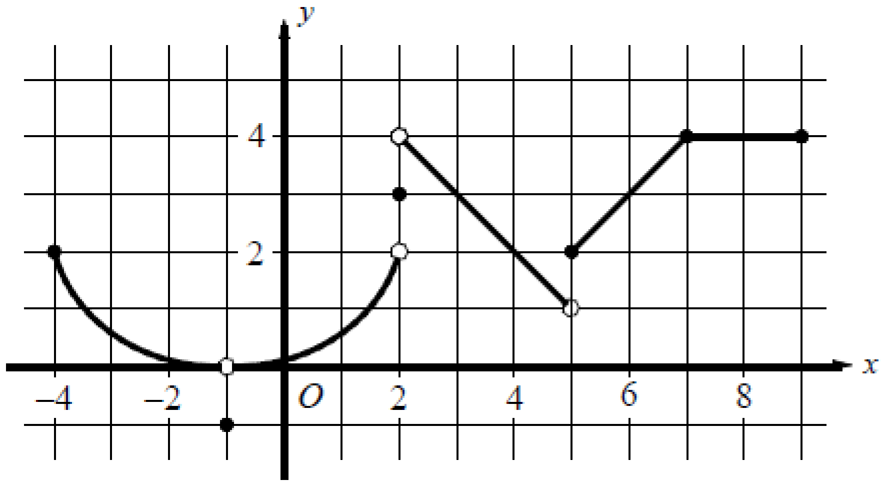
I. $\lim_{x \to 0} f(x) = 2$

II. $\lim_{x \to 2} f(x) = 0$

III. $\lim_{x \to 1} f(x) = \lim_{x \to 6} f(x)$

(A) I only (B) II only (C) II and III only (D) I , II, and III

4)



The figure above shows the graph of $y = f(x)$ on the closed interval $[-4, 9]$.

Find $\lim_{x \to -1} \cos(f(x))$.

(A) DNE (B) 1 (C) 0 (D) -1

5) $\lim_{x \to 0} \frac{-x^2 + 4}{x^2 - 1} =$

A) 1 B) 0 C) -4 D) -1

6) $\lim_{x \to 0} \frac{\sqrt{4+x}-2}{x} =$

(A) $\frac{1}{8}$ (B) $\frac{1}{4}$ (C) $\frac{1}{2}$ (D) nonexistent

7) $\lim_{x \to 3} \frac{\frac{1}{x}-\frac{1}{3}}{x-3} =$

(A) $-\frac{1}{9}$ (B) $\frac{1}{9}$ (C) -9 (D) 9