MATH2250 - Calculus I for Science and Engineering

Assignment 1 - Due September 7, 2017

1 Calculating Limits

Evaluate the following limits if they exist, justifying your answers. If the limit does not exist, explain why.

i) $\lim_{x\to -1} \dfrac{x^2+1}{x^2+2x-3}$ ii) $\lim_{x\to -2} \dfrac{x^2+4x+4}{x^2-3x-10}$ iii) $\lim_{r\to 4} \dfrac{\sqrt{r}+5}{(r-4)^2}$ iv) $\lim_{v\to -\infty} \dfrac{4-v^2}{|8-v^3|}$

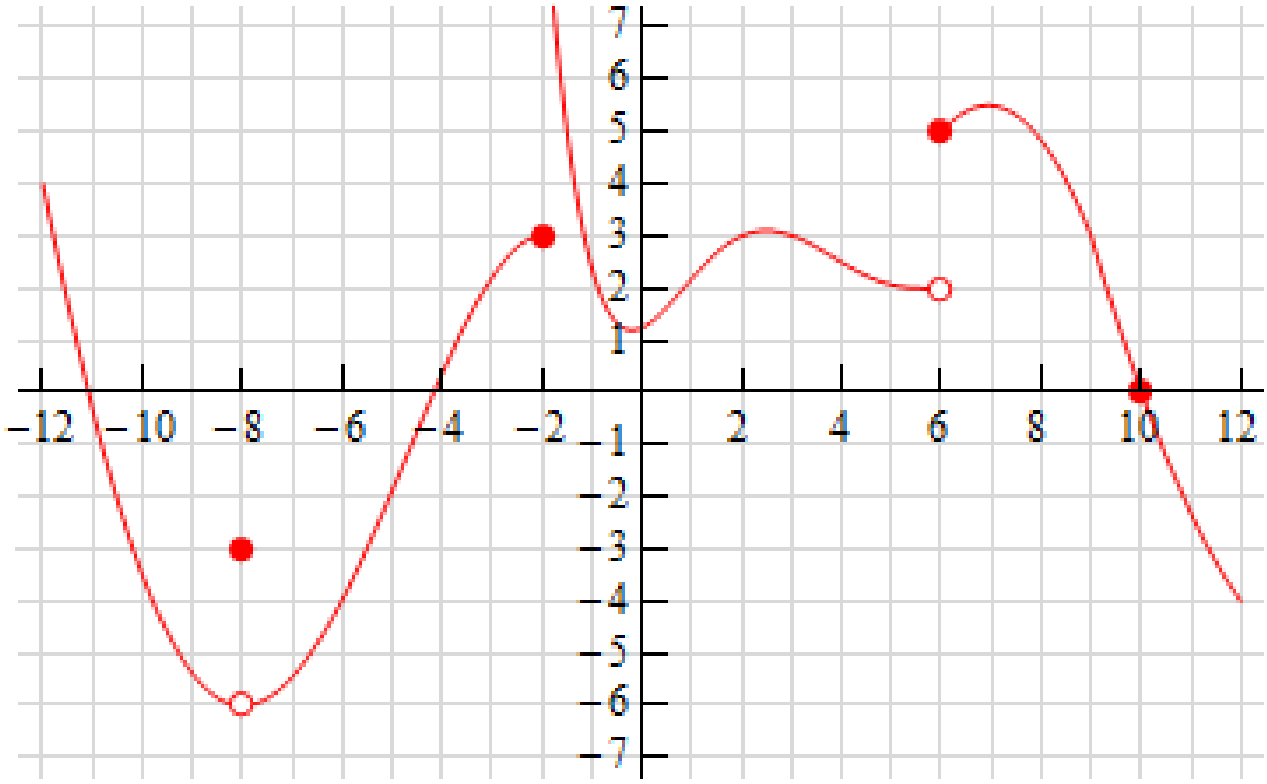
v) $\lim_{v\to -2} \dfrac{|v+2|}{|2-v|}$ vi) If $4-\cos(\pi x) \le f(x) \le x^2-6x+14$ for all $x \ge 0$, determine $\lim_{x\to 3} f(x)$

2 Limits from Graphs

Assuming the graph below is of a function $f(x)$, evaluate the following:

i) $\lim_{x\to 6^-} f(x)$ ii) $\lim_{x\to 6^+} f(x)$ iii) $f(6)$ iv) $\lim_{x\to -8} f(x)$ v) $f(-8)$

vi) $\lim_{x\to 10^-} f(x)$ vii) $\lim_{x\to 10^+} f(x)$ viii) $f(10)$ ix) $\lim_{x\to -2^-} f(x)$ x) $\lim_{x\to -2} f(x)$



3 Graphs from Limits

Sketch a **single** function that satisfies **all** of the following conditions:

i) $\lim_{x\to\infty} f(x) = 3$ ii) $\lim_{x\to-\infty} f(x) \to \infty$ iii) $\lim_{x\to 4} f(x) \to -\infty$ iv) $\lim_{x\to 6} f(x) = 4$ v) $f(6) = 6$

vi) $\lim_{x\to-2^-} f(x) \to \infty$ vii) $\lim_{x\to-2^+} f(x) \to -\infty$ viii) $\lim_{x\to 1^+} f(x) = 3$ ix) $\lim_{x\to 1^-} f(x) = -2$ x)$f(1) = 3$

4 Continuity

i) Determine the value(s) of b which ensure that $q(r)$ is continuous **for all** r.

$$q(r) = \begin{cases} \dfrac{r-b}{b+1} & r \leq 0 \\ \\ r^2 + b & r > 0 \end{cases}$$

ii) Determine the value(s) of k which ensure that $f(x)$ is continuous **for all** x.

$$f(x) = \begin{cases} k^2 e^{2x} & x \leq 0 \\ \cos\left(\dfrac{\pi x}{2}\right) & 0 < x \leq 1 \\ 1 + kx & 1 < x \end{cases}$$

iii) Determine the value(s) of c which ensure that $p(t)$ is continuous **for all** t.

$$p(t) = \begin{cases} ct + 3 & t < c \\ \dfrac{t^2}{2} + 5 & t \geq c \end{cases}$$