

# MATH2250 - Calculus I for Science and Engineering

## Assignment 1 - Due February 5, 2017

### 1 Calculating Limits

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

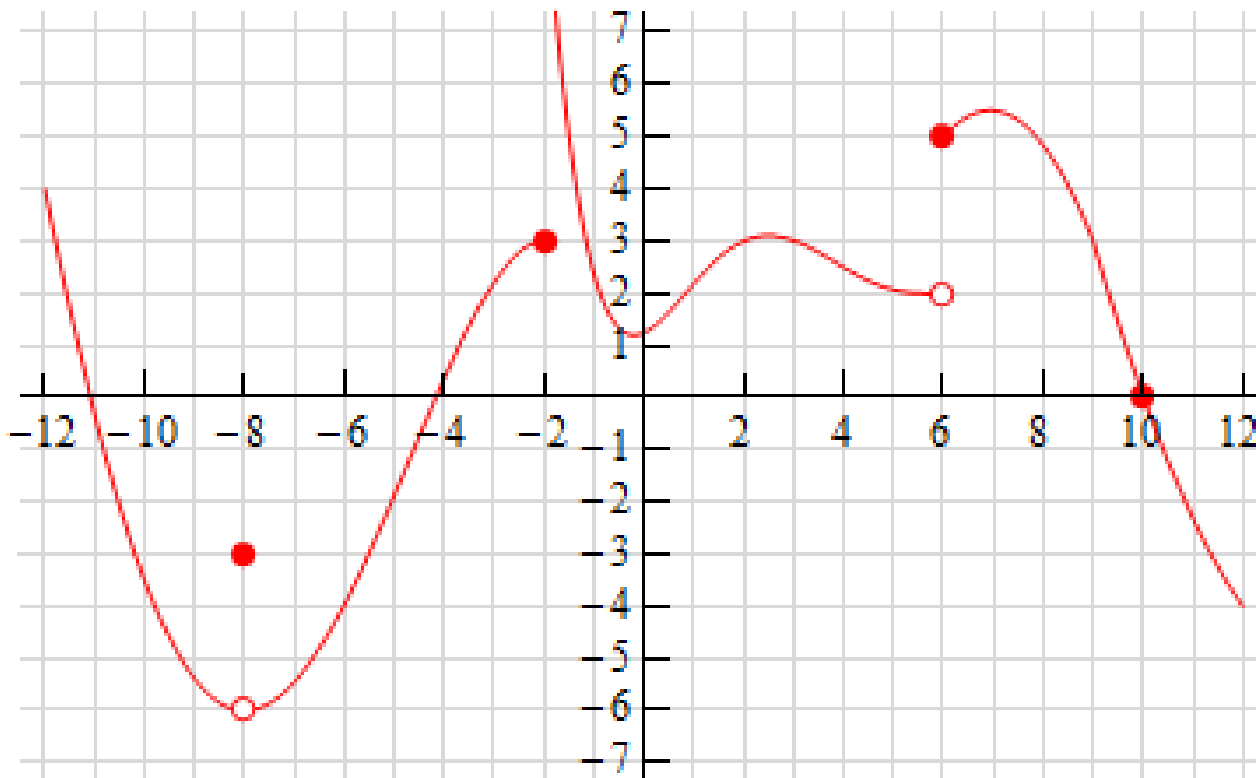
i)  $\lim_{x \rightarrow -1} \frac{x^2 + 1}{x^2 + 2x - 3}$     ii)  $\lim_{x \rightarrow -2} \frac{x^2 + 4x + 4}{x^2 - 3x - 10}$     iii)  $\lim_{r \rightarrow 1} \frac{\sqrt{r} + 5}{(r - 1)^2}$     iv)  $\lim_{v \rightarrow -\infty} \frac{4 - v^2}{|16 - v^2|}$

v)  $\lim_{v \rightarrow -2} \frac{|v + 2|}{|2 - v|}$     vi) If  $4 - \cos(\pi x) \leq f(x) \leq x^2 - x + 3$  for all  $x \geq 0$ , determine  $\lim_{x \rightarrow -1} f(x)$

### 2 Limits from Graphs

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

i)  $\lim_{x \rightarrow 6^-} f(x)$     ii)  $\lim_{x \rightarrow 6^+} f(x)$     iii)  $f(6)$     iv)  $\lim_{x \rightarrow -8} f(x)$     v)  $f(-8)$   
vi)  $\lim_{x \rightarrow 10^-} f(x)$     vii)  $\lim_{x \rightarrow 10^+} f(x)$     viii)  $f(10)$     ix)  $\lim_{x \rightarrow -2^-} f(x)$     x)  $\lim_{x \rightarrow -2} f(x)$



### 3 Graphs from Limits

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

- i)  $\lim_{x \rightarrow \infty} f(x) = 3$  ii)  $\lim_{x \rightarrow -\infty} f(x) \rightarrow \infty$  iii)  $\lim_{x \rightarrow 4} f(x) \rightarrow -\infty$  iv)  $\lim_{x \rightarrow 6} f(x) = 4$  v)  $f(6) = 6$   
vi)  $\lim_{x \rightarrow -2^-} f(x) \rightarrow \infty$  vii)  $\lim_{x \rightarrow -2^+} f(x) \rightarrow -\infty$  viii)  $\lim_{x \rightarrow 1^+} f(x) = 3$  ix)  $\lim_{x \rightarrow 1^-} f(x) = -2$  x)  $f(1) = -2$

### 4 Continuity

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

$$q(r) = \begin{cases} \frac{r - 3b}{b + 1} & r \leq 0 \\ r^2 + b & r > 0 \end{cases}$$

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

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

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

$$p(t) = \begin{cases} ct - 2 & t \leq c \\ \frac{t^2}{2} & t > c \end{cases}$$