



MATH 151

1. Compute the following limits and justify your answers.

[1] (a) $\lim_{x \rightarrow 4} \frac{x+4}{x^2-3x+2}$

[2] (b) $\lim_{x \rightarrow 1} \frac{x-3}{x^2-9}$

[2] (c) $\lim_{x \rightarrow 4} e^{\frac{\ln(x+5)-3}{x-4}}$



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[3] (d) Use the squeeze theorem to calculate

$$\lim_{x \rightarrow 0} x^2 \sin \frac{1}{x^2} :$$

2. Short Answer. No part marks given. No justification required.

[1] (a) A function f has a vertical asymptote at $x = a$ if _____

[1] (b) Suppose $\lim_{x \rightarrow a} f(x) = L$ and $\lim_{x \rightarrow a} g(x) = M$. Then

$$\lim_{x \rightarrow a} (3f(x) - 2g(x)) = \underline{\hspace{10cm}}$$

[1] (c) Give an example which is one-to-one for $x > 0$

$$f(x) =$$

[1] (d) Give an example of a function with a horizontal asymptote at

$$f(x) =$$

[1] (e) Give an example of a function defined on \mathbb{R} but $e^{6410x} - 91$ To-1]lim



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5. Fill in the blanks in the following definitions. No justification required.

[2] (a) The limit of $f(x)$ as x approaches a is L means that for all _____ there exists _____ such that _____ whenever _____.

[1] (b) A function $f(x)$ is continuous at $x = a$ if _____.

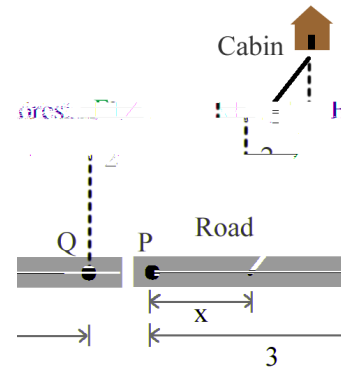
[4] 6. (a) Use the formal definition of the derivative to calculate the derivative of

$$f(x) = \frac{1}{x+2}$$



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7. A hiker starting at a point P on a straight road wants to reach a forest cabin that is 2 km from a point Q , 3 km down the road from P . See the diagram. She can walk 8 km/hr along the road but only 4 km/hr through the forest.



- [4] (a) Find the time it takes her to walk from P to the cabin as a function of where x is the distance she has walked along the road before entering the forest.

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- [1] (b) What is the domain of the function found in part (a)?