

Practice Midterm 1

MATH 9A

Prof. Janet Vassilev

October 13, 2005

1. Compute $\lim_{x \rightarrow 0} \frac{\sqrt{9-x} - 3}{3x}$
2. Using the definition of the limit, show that $\lim_{x \rightarrow 4} 6 - 2x = -2$.
3. Suppose f is an odd function and we know $\lim_{x \rightarrow -2^-} f(x) = 3$. Can we say anything about $\lim_{x \rightarrow 2^-} f(x)$ or $\lim_{x \rightarrow 2^+} f(x)$? Explain your answer.
4. Find the horizontal and vertical asymptote(s) of the function $f(x) = \frac{2x^2 - 5x - 3}{x^2 - 4x + 3}$.
5. Find $\lim_{x \rightarrow 0} \frac{\sin^2(3x)}{x^2}$.
6. Using the Intermediate Value Theorem, show that $f(x) = x^3 - 4x + 11$ has a root.
7. Find the slope of the tangent line to $f(x) = x - 3x^2$ at $(1, -2)$ using the definition $m_{tan} = \lim_{h \rightarrow 0} \frac{f(c+h) - f(c)}{h}$.
8. Find the equation of the tangent line to $f(x) = \frac{2\sqrt{x}}{\sqrt{x}-1}$ at the point $(4, 4)$.
9. The position of a point moving along the x axis is $x(t) = 3 - 3 \cos t$ units. Find the speed of the point at time $t = \frac{\pi}{6}$

10. Refer to the graph below to answer the following:

- (a) Where is $f(x)$ continuous?
- (b) Where is $f(x)$ differentiable?
- (c) Identify the x values of any jump discontinuities.
- (d) Identify the x values of any removable discontinuities.
- (e) Find $\lim_{x \rightarrow 2^+} f(x)$.

11. Find the first two derivatives of $f(x) = x \tan x$.