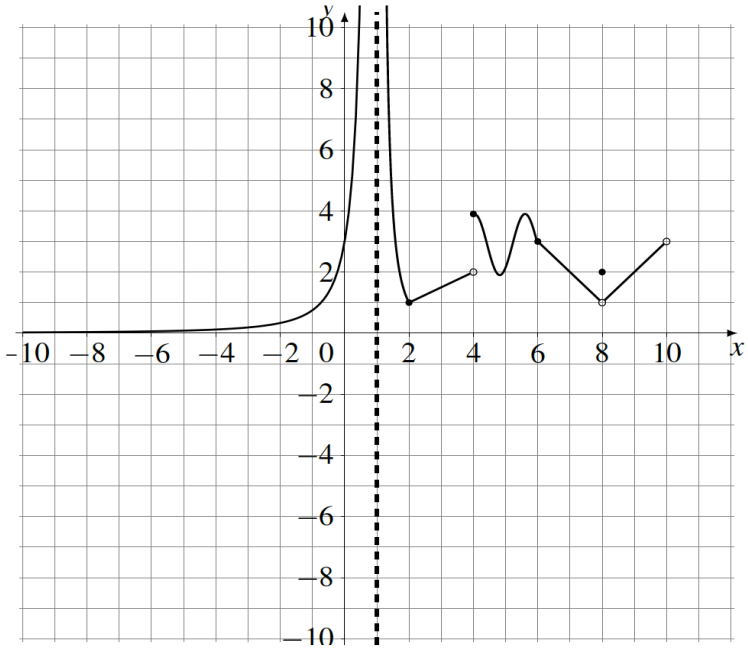
Name: _____ Group #: _____

1. Consider the graph of $f(x)$ given below:



(a) Find the following:

i. $\lim_{x\to 4} f(x)$

ii. $\lim_{x\to 1^+} f(x)$

iii. $\lim_{x\to 8} f(x)$

iv. $\lim_{x\to 10^-} f(x)$

v. $\lim_{x\to -\infty} f(x)$

vi. $f'(3)$

(b) State any horizontal and vertical asymptotes for $f(x)$. If there are none, state that.

(c) Identify any points of discontinuity for $f(x)$ **AND** indicate the type of discontinuity for each one.

(d) At which points, if any, is $f(x)$ continuous **but not** differentiable? State the x-value of any such points.

2. Use the limit definition of the derivative to find the derivative of $f(x) = x^3 - 9x$.

3. Using limits, find an equation of the line tangent to the function $g(x) = \dfrac{4}{x^2}$ at $x = -2$.

4. Using the limit definition of the derivative, find the derivative of $g(x) = \sqrt{2x+1}$.

5. Using limits, find an equation of the line tangent to the function $f(x) = 5x - 3x^2$ at $x = 2$.

6. For $f(x) = x^2$, write the linear approximation at $a = 1$ and estimate $f(1.05)$.

7. For $f(x) = \dfrac{1}{1+x}$, write the linear approximation at $a = 0$ and estimate $f(-0.1)$. (Note: The derivative of this function should be similar to one in the note packet)

8. Find the linearization of each function at the indicated value using the derivative provided.

   (a) $f(x) = \sin x$ at $x = \frac{\pi}{2}$ if $f'(x) = \cos(x)$

   (b) $f(x) = x^{3/2}$ at $x = 16$ if $f'(x) = \frac{3}{2}x^{1/2}$

   (c) $f(x) = 2^x$ at $x = 0$ if $f'(x) = \ln(2)2^x$