

Name: _____ / 25

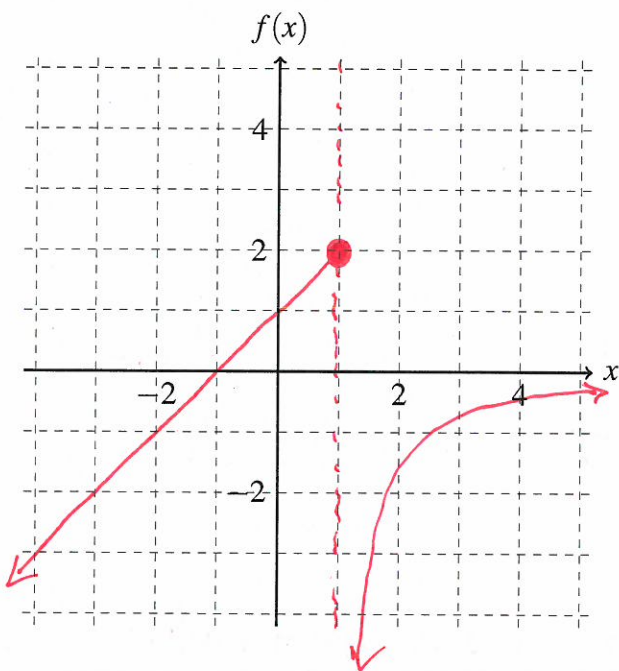
Circle one: Faudree (F01) | Bueler (F02) | VanSpronsen (UX1)

25 points possible. No aids (book, calculator, etc.) are permitted. Show all work and use proper notation for full credit.

1. [8 points] On the axes below, sketch the graph of the function

$$f(x) = \begin{cases} 1+x & x < 1 \\ 2 & x = 1 \\ \frac{1}{1-x} & x > 1 \end{cases}$$

Then compute the requested values.



a. $f(1) =$ 2

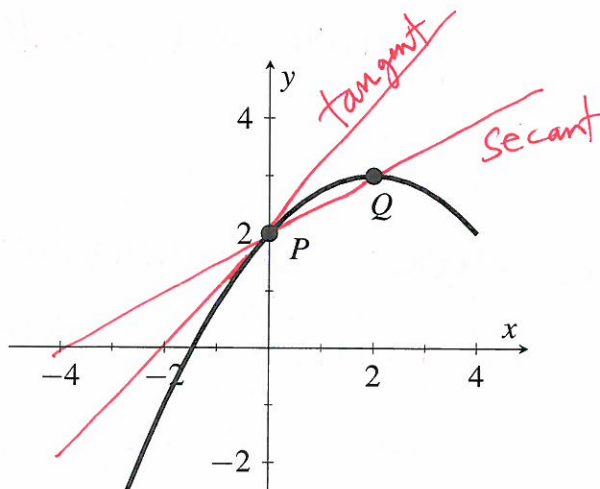
b. $\lim_{x \rightarrow 1^-} f(x) =$ 2

c. $\lim_{x \rightarrow 1} f(x) =$ d.n.e.

Justify your answer to part c:

$$\left. \begin{aligned} \lim_{x \rightarrow 1^-} f(x) &= 2 \\ \lim_{x \rightarrow 1^+} f(x) &= -\infty \end{aligned} \right\} \text{not equal}$$

2. [4 points] Consider the following graph $y = f(x)$.



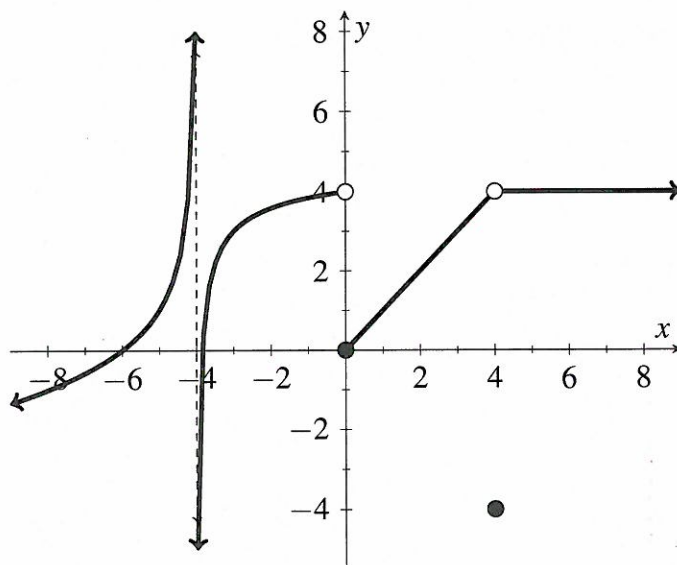
a. Sketch the secant line through points P and Q. (Add the line to the graph at left.) ✓

b. Find the slope of the secant line through the same points $P(0, 2)$ and $Q(2, 3)$.

$$m = \frac{3 - 2}{2 - 0} = \frac{1}{2}$$

c. Sketch the tangent line through point P. ✓

3. [9 points] Use the graph of the function $f(x)$ to answer the following questions.



a. $f(-6) = 0$

b. $f(0) = 0$

c. $f(4) = -4$

d. $\lim_{x \rightarrow 0^+} f(x) = 0$

e. $\lim_{x \rightarrow 0^-} f(x) = 4$

f. $\lim_{x \rightarrow 0} f(x) = \text{d.n.e.}$

g. $\lim_{x \rightarrow -4^+} f(x) = -\infty$

h. $\lim_{x \rightarrow 6} f(x) = 4$

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

4. [4 points] Compute the following limits.

a. $\lim_{x \rightarrow 4} \frac{x-3}{(x-4)^2} = \boxed{+\infty}$

(because numerator $\approx +1$
but denominator is
positive and small)

b. $\lim_{x \rightarrow 0^+} \frac{2}{\sin(x)} = \boxed{+\infty}$

(because denominator
is positive and small)