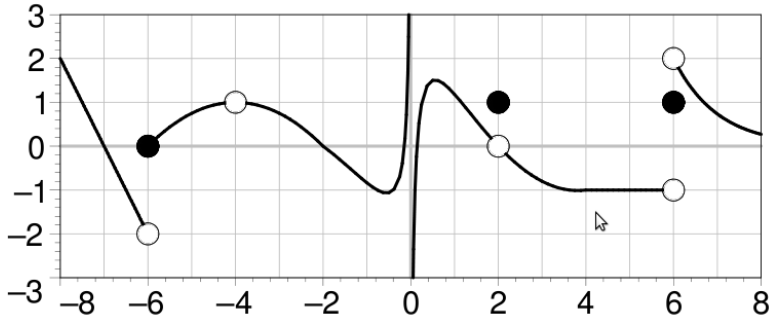
MAT122
Practice Exam 1

1. Let $f(x)$ be the function whose graph is shown below.



Compute the following limits:

(a) $\lim_{x\to 6^+} f(x)$

(b) $\lim_{x\to 0^+} f(x)$

(c) $\lim_{x\to 2} f(x)$

(d) $\lim_{x\to -2} f(x)$

(e) $\lim_{x\to -6} f(x)$

(f) $\lim_{x\to 0} f(x)$

2. List all values for which the function above is *not* continuous.

3. Compute the following limits:

(a) $\lim_{x\to\infty} \dfrac{e^{-x}}{x}$

(b) $\lim_{x\to 2^+} \dfrac{1}{2-x}$

(c) $\lim_{x\to 3} \dfrac{x-3}{x^2-2x-3}$

(d) $\lim_{x\to\infty} \dfrac{5x-6x^3}{2x^3+8}$

(e) $\lim_{x\to 0^+} \ln(x)$

(f) $\lim_{x\to\infty} \arctan(x)$

4. Graph the functions

(a) $\frac{1}{2}\sin(x-\pi)+3$

(b) $\dfrac{3x^2}{x^2-1}$

5. **(a)** Solve for x using the natural logarithm, $\ln$.

$$e^x = 5e^{1-x}$$

(b) Solve for y using log base 2, $\log_2$.

$$2^{y-1} = 8^{y-3}$$

(c) Solve for t.

$$\ln(t-3) = \ln(t) - \ln(2)$$

6. $f(x) = \dfrac{x+1}{x+2}$. Find an expression for $f^{-1}(x)$.

7. $f(x) = 1/x$. Use the limit definition of derivative to solve the following.

(a) Find $f'(3)$.

(b) Write the derivative as a function of x. That is, find $f'(x)$.

(c) If $f(x)$ gives the displacement at time x, measured in seconds, find the instantaneous velocity at time 4 seconds.

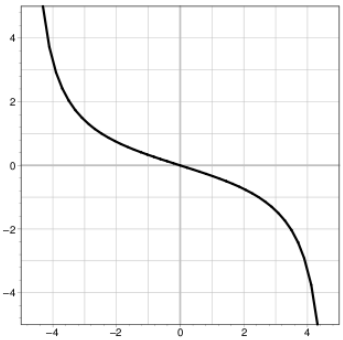
(d) Find the average velocity on the time interval [2,3].

8. Use the intermediate vale theorem to show that

$$p(x) = x^5 + x^2 - 2x^3 - 2$$

has a root between 1 and 2.

9. Let $f(x)$ be the function whose graph is shown below.



Using a straight edge, estimate $f'(0)$.