Some Review Problems
for Exam #1

1. Determine whether the following functions are even, odd, or neither.
   $e(x) = x^2 + 4x + 8$
   $f(x) = x \sin x$
   $g(x) = \sqrt{x^2 + 1}$
   $h(x) = 2x - \sqrt[3]{x}$

2. For $\ell(t) = t^2 + 1$, compute $\ell\Big(\ell\big(\ell(1)\big)\Big)$.

3. For $f(x) = \sqrt{x+1}$ and $g(x) = x^2 - 1$ compute $g\big(f(3)\big)$, and $f\big(g(3)\big)$.

4. The tide in the Bay of Fundy has a tide cycle of 12.4 hours. Suppose that at a certain measuring point, the depth of the water oscillates between 4 meters and 21 meters. If we model the depth of the water t hours from now by the function

$$D(t) = C + A\sin(at),$$

   find the appropriate values for the constants C, A, and a.

5. Sketch a graph of $g(t) = -2 + 4\sin(\frac{\pi}{3}t)$ on the interval $[-6, 6]$.

6. Consider the piecewise function $r(t)$, given below.

$$r(t) = \begin{cases} -2t^2 + 3 & , \ t \le -2 \\ 5t - 1 & , \ -2 < t < 1 \\ 1 & , \ t = 1 \\ \frac{t^2+2t-3}{t-1} & , \ t > 1 \end{cases}$$

   Compute the following:

$$\lim_{t\to -2^-} r(t) \qquad \lim_{t\to -2} r(t) \qquad \lim_{t\to 1^-} r(t) \qquad \lim_{t\to 1} r(t)$$
$$\lim_{t\to -2^+} r(t) \qquad r(-2) \qquad \lim_{t\to 1^+} r(t) \qquad r(1)$$

7. For the function $f(y) = \dfrac{2y^2 - 3y - 9}{y^2 - y - 6}$, compute the following:

$$\lim_{y\to 3} f(y) \qquad \lim_{y\to -2^-} f(y) \qquad \lim_{y\to \infty} f(y) \qquad \lim_{y\to -2^+} f(y)$$

8. Compute the following limits:

   (a) $\displaystyle\lim_{x\to\infty} \frac{4\sqrt{x}}{\sqrt{2x+1} - \sqrt{x}}$

   (b) $\displaystyle\lim_{x\to -\infty} \frac{\sqrt{x^2 + x}}{3x}$

   (c) $\displaystyle\lim_{x\to 0} \frac{x}{\tan x}$

   (d) $\displaystyle\lim_{x\to 0} \frac{1 - \cos 5x}{3x}$

9. Let $a(x) = \dfrac{(x-1)(x^2-1)(3x+2)}{(x-1)(x+3)(x^2+1)}$.

   (a) For which values of x is $a(x)$ discontinuous? State whether each discontinuity is a hole or an asymptote and if it is a hole, compute the y-value of the hole.

   (b) Find the horizontal asymptote of $a(x)$ by computing $\lim_{x\to\infty} a(x)$.

   (c) Find the y-intercept of $y = a(x)$.

   (d) Find the x-intercept(s) of $y = a(x)$.

10. Use the Intermediate Value Theorem to show that the function $f(x) = x^5 - 4x^3 + x^2 + 1$ has a zero in the interval $[0, 1]$.

11. Let

$$p(y) = \begin{cases} y^3 - 1 & , \ y \leq 1 \\ 4y + A & , \ y < 1 \end{cases}$$

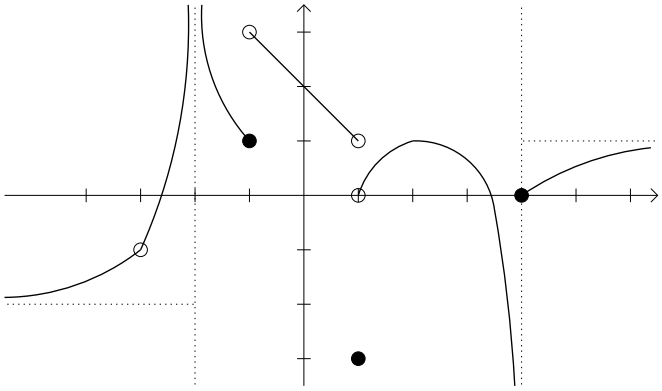
    For what value of the constant A will $p(y)$ be a continuous function?

12. Let

$$q(t) = \begin{cases} t^2 + 1 & , \ t \leq A \\ 3t + 11 & , \ t > A \end{cases}$$

    For what value of the constant A will $q(t)$ be a continuous function?

13. Consider the graph of the function $f(x)$ given below.



    Compute the following limits:

$\lim_{x\to -3} f(x)$ $\quad$ $\lim_{x\to -2} f(x)$

$\lim_{x\to -1^-} f(x)$ $\quad$ $\lim_{x\to -1^+} f(x)$

$\lim_{x\to 1^-} f(x)$ $\quad$ $\lim_{x\to 1^+} f(x)$

$\lim_{x\to 4^-} f(x)$ $\quad$ $\lim_{x\to 4^+} f(x)$

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