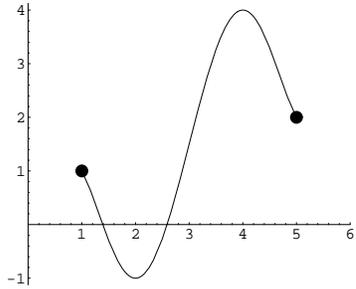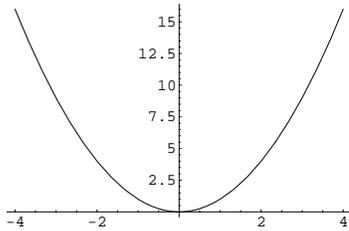**Math S-Xab Summer 2004**
Worksheet: Analysis of Extrema
July 15, 2004

For each of the functions in items 1–8, identify all extrema (local and absolute) and extreme values.
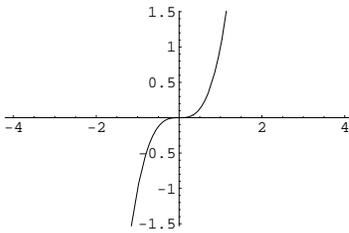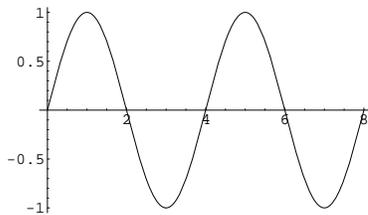
1. Domain $= [1, 5]$

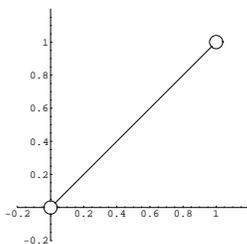2. $f(x) = x^2$, Domain $= (-\infty, \infty)$

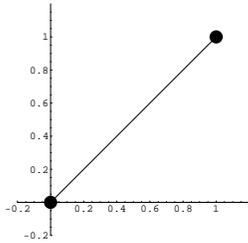3. $f(x) = x^3$, Domain $= (-\infty, \infty)$
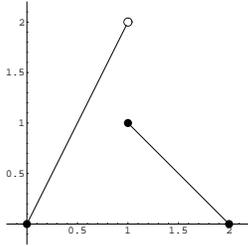

4. Domain $= [0, 8]$

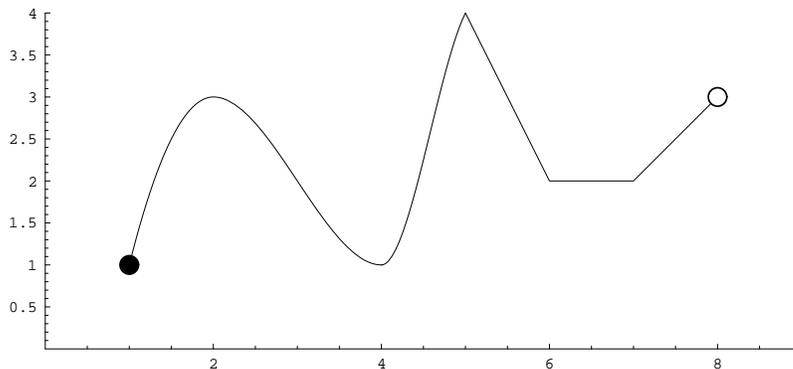
5. Domain $= (0, 1)$

6. Domain $= [0, 1]$

7. Domain $= [0, 2]$

8. Domain $= [1, 8)$

9. Let $f(x) = \dfrac{e^x}{x}$.

   (a) Determine the intervals on which f is increasing or decreasing.
   (b) Identify any local extrema of f.
   (c) Determine the intervals on which f is concave up or concave down.
   (d) Identify any inflection points of f.
   (e) Use this information to sketch the graph of f.

10. Sketch the graph of a single function f that satisfies all of the following conditions.

   (a) $f(x) > 0$ for x in $(-2, 6)$
   (b) $f(x) < 0$ for x in $(-\infty, -2) \cup (6, \infty)$
   (c) $f(x) = 0$ for $x = -2, 6$
   (d) $f'(x) > 0$ for x in $(-\infty, -1) \cup (1, 4)$
   (e) $f'(x) < 0$ for x in $(4, \infty)$
   (f) $f'(x) = 0$ for x in $[-1, 1]$ and for $x = 4$
   (g) $f''(x) > 0$ for x in $(-\infty, -3) \cup (1, 2)$
   (h) $f''(x) < 0$ for x in $(-3, -1) \cup (2, \infty)$