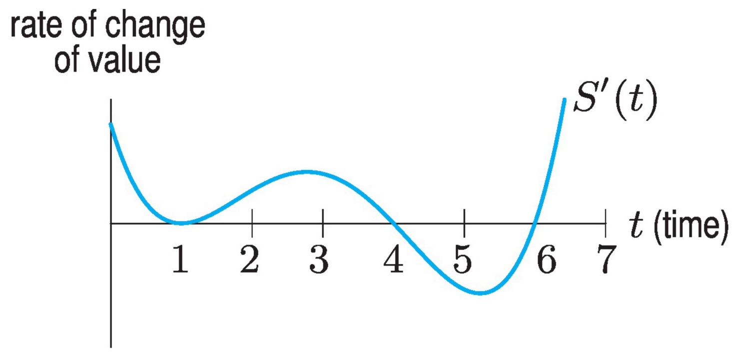
Name:
Section 4.1 & 4.2 – In class examples
Math 151 – Spring 2018
Section 4.1

1. Find and classify the critical points of $x^3 - 9x^2 - 48x + 52$ using the second derivative test.
   $f'(x) = 3x^2 - 18x - 48 = 3(x-8)(x+2)$ setting $f'(x) = 0$ and solving yeilds $x = 8, -2$. We can test the nature of the critical points using the second derivative. Indeed, $f''(x) = 6x - 18$ so then $f''(8) = 30$ and $f''(-2) = -30$. We conclude that $x = 8$ is a local minimum and $x = -2$ is a local maximum.

2. The value of an investment at time t is given by $S(t)$. The rate of change, $S'(t)$, of the value of the investment is shown in the figure below



   (a) What are the critical points of the function $S(t)$. The critical points of S occur at times t when $S'(t) = 0$. We see that $S'(t) = 0$ at $t = 1$, 4, and 6, so the critical points occur at $t = 1, 4$, and 6.

   (b) Identify each critical point as a local maximum, a local minimum, or neither.
   We see that $S'(t)$ is positive to the left of 1 and between 1 and 4, that $S'(t)$ is negative between 4 and 6, and that $S'(t)$ is positive to the right of 6. Therefore (t) is increasing to the left of 1 and between 1 and 4 (with a slope of zero at 1), decreasing between 4 and 6, and increasing again to the right of 6. We see that S has neither a local maximum nor a local minimum at the critical point $t = 1$, but that it has a local maximum at $t = 4$ and a local minimum at $t = 6$.

   (c) Explain the financial significance of each of the critical points.
   At time $t = 1$ the investment momentarily stopped increasing in value, though it started increasing again immediately afterward. At $t = 4$, the value peaked and began to decline. At $t = 6$, it started increasing again.