

Second Hour Exam(15 pts) **1.** Find the following limits.

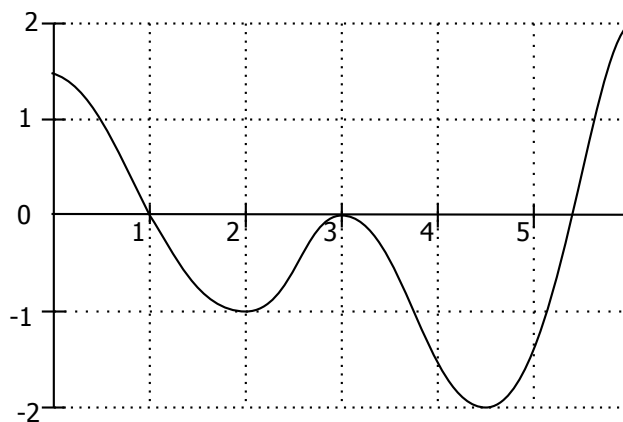
(a) $\lim_{x \rightarrow 0} \frac{e^x - 1}{\sin x}$

(b) $\lim_{x \rightarrow 0} \frac{e^x}{\sin x - 1}$

(c) $\lim_{x \rightarrow \infty} \frac{4x^3 - 3x + 8}{6x^3 + x^2 + x - 12}$

(30 pts) **2.** Let $f(x) = \frac{x^2}{x+1}$.(a) Find all critical points of f .

(b) Use the second derivative test to classify the critical points as maxima or minima.

(c) Find the absolute maximum and minimum values of f on the interval $[-3, -\frac{3}{2}]$ (10 pts) **3.** Estimate a root of the polynomial $f(x) = x^3 + x + 3 = 0$ by performing one step of Newton's method, beginning with $x_0 = -1$.(15 pts) **4.** Find the point on the parabola $y = x^2$ which is closest to the point $(3, 0)$.(30 pts) **5.** Shown below is the graph of $f'(x)$, the **derivative** of the function $f(x)$.(a) Using the graph of $f'(x)$ below, determine the intervals where $f(x)$ is increasing, decreasing, concave up or concave down.(b) Given that $f(0) = 0$, use your results from part (a) to sketch the graph of $f(x)$ for $x \in [0, 6]$.(c) On the graph of $f(x)$ that you sketched in part (b), clearly label all maxima, minima, and inflection points.Remember, this is the graph of the **derivative** of $f(x)$, not the graph of $f(x)$ itself!**Hand in this sheet along with your exam booklet!**