Your Name: _____

On this exam, you may use a calculator. It is not sufficient to just write down the answers. You must **show your work** to get full credit.

$$
\begin{array}{lll}
1 & (20) & \underline{\hspace{2cm}} \\
2 & (20) & \underline{\hspace{2cm}} \\
3 & (20) & \underline{\hspace{2cm}} \\
4 & (20) & \underline{\hspace{2cm}} \\
5 & (20) & \underline{\hspace{2cm}} \\
\text{Total} & (100) & \underline{\hspace{2cm}}
\end{array}
$$

- **Problem 1** Find the maximum value of the function
$$f(x) = x - \sqrt{x}$$
  on the interval $[0, 4]$.

- **Problem 2** Two cars start moving from the same point. One travels south at 60 mi/h and the other travels west at 25 mi/h. At what rate is the distance between the cars increasing two hours later?

- **Problem 3** Evaluate the limits.

$$a) \quad \lim_{x \to 0} \frac{\tan(\pi x)}{\ln(1 + 2x)}$$

$$b) \quad \lim_{x \to 0} \frac{1 - \cos x}{x^2 + x}$$

- **Problem 4** Consider the function
$$f(x) = \frac{x^3}{3} - \frac{x^2}{2} - 6x + 2.$$
Find the intervals on which this functions is increasing/decreasing, the local maxima and minima, the intervals where the function is concave up/down and the inflection points.

- **Problem 5** Evaluate the integrals.

$$a) \quad \int_0^1 x^2(1+2x^3)^5 dx$$

$$b) \quad \int t\sin(3t)dt$$