

1) (20 pts.) Sketch the graph of $y = x^3 - 9x^2 + 24x - 7$. Plot any stationary points or points of inflection.

2) (15 pts.) Compute the following limits.

a) $\lim_{x \rightarrow \pi/2} \frac{(\frac{\pi}{2} - x)^2}{1 - \sin x}$

b) $\lim_{x \rightarrow 0^+} \ln x \sin x$

c) $\lim_{x \rightarrow 0} \frac{1}{x^2} \int_0^x (e^{t^2} - 1) dt$

3) (15 pts.) Are the following true or false?

a) $f''(x) > 0$ on an open interval (a, b) then $f(x)$ is increasing on (a, b) .

b) If $f''(x) = 0$ then x is a point of inflection.

c) If x_0 is a point of inflection then $f''(x_0) = 0$.

4) (15 pts.) Express the number 27 as the sum of two nonnegative numbers whose product is as large as possible. *Show all of your work; partial credit will not be given if there is no work!*

5) (10 pts.) Evaluate the following integrals.

a) $\int (x^{13} + 13^x) dx$

b) $\int_0^1 \frac{x^2}{1+x^2} dx$

6) a) (10 pts.) Find a function y satisfying $\frac{dy}{dx} = \tan x \sec x$, $y(\pi/4) = \sqrt{2}$.

b) (5 pts.) Is there a function $f(t)$ so that $\int_1^x f(t) dt = x^2$? If so what is f ?
If there is no such f , explain why?

7) (10 pts.) Find the area of the region enclosed by the curves $y = (x-1)^2 - 1$ and $y = -x + 2$.