Calculus I, Section 3 M. van Frankenhuijsen

Review for Exam II November 11–14

1. List all horizontal and vertical asymptotes of the graph
$$y = \frac{\sqrt{x^2+4x}}{4x+1}.$$

2. True or false? Give an explanation.

   The equation $\cos x = x$ is satisfied for some x between 0 and 1.

3. An object is moving along the y-axis and its velocity at any time $t \geq 0$ is $y(t) = 6/\sqrt{t+4}$. It starts at the origin at time $t = 0$.

   Find the position of the object at the instant $t = 2$.

4. Explain the difference between an absolute and a local minimum.

5. Why are we interested in the roots of $f'(x) = 0$? What are we *really* interested in?

6. Concerning $f''(x)$, what information does it give us, and how do we obtain this information?

7. Why do two antiderivatives of a function have a constant difference? What condition needs to be satisfied?

8. Give an example of two antiderivatives of a single function that do not differ by a constant.

9. Would the fundamental theorem of calculus still work of we defined integral as the area between a curve and the x-axis, not the signed area?

10. Find the derivative of $\displaystyle\int_{x^2+x}^{1-x} \sqrt{t^3-1}\,dt$.

11. Approximate $\displaystyle\sum_{i=0}^{1000} \sqrt{i}$ using an integral.

12. Approximate $\sqrt[3]{2}$ using Newton's method.

13. Approximate $1/7$ by applying Newton's method once to an initial (decimal) approximation to a root of the equation $1/x = 7$.

14. Sketch the graph of $f(x) = \cos x + \sin^2 x$.

15. Find the point on the parabola $x = y^2 - 1$ closest to the point $(1, 1)$.

16. Compute $\displaystyle\int_0^1 x^2 \left(2x^3 + 3\right)^4 \, dx$.

17. Approximate $\displaystyle\int_0^1 \frac{1}{2x+1} \, dx$ using the midpoint rule with $n = 4$.

18. Evaluate the integral.

    (a) $\displaystyle\int_{-1}^0 x(2x^2 + 1)^7 \, dx$

    (b) $\displaystyle\int_0^2 \frac{x}{\sqrt{x^2 + 5}} \, dx$

19. Use the midpoint rule with $n = 4$ to approximate $\displaystyle\int_{-1}^1 \sin(x^2) \, dx$.