Whitman College Calculus Placement Examination

When you take this exam you may not use supplementary written material, such as tables, notes, or books, and you may not use a calculator.

The final answer to every problem is an integer value between -99 and 99.

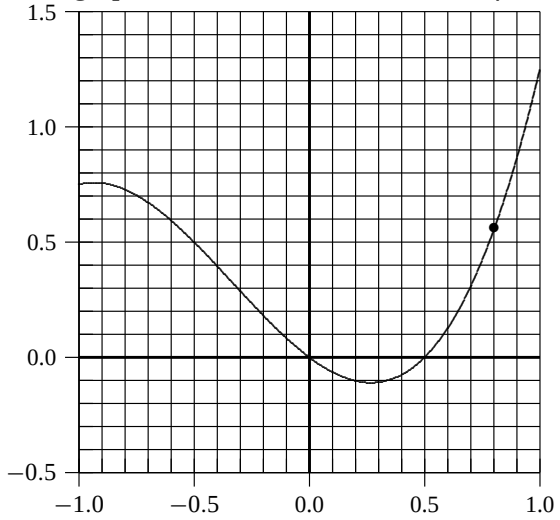
You may want to record your answers in the boxes provided on this sheet to make it easier to transfer your answers to the input boxes on the webpage.

There is no time limit, but you should be able to finish in less than 2 hours.

Questions 1–9 contain material from Calculus I, Math 125. If any of these questions are of an unfamiliar type, you should register for Math 125.

1. Compute the value of $\lim_{x\to 1}\left(\dfrac{14}{x-1}-\dfrac{28}{x^2-1}\right)$.

2. For the function $f(x)$ whose graph is sketched below, estimate $f'(0.8)$.



3. Find the y-intercept of the tangent line to the curve $y = x^3 - 2x + 8$ at the point $(1, 7)$.

4. Find the derivative of $f(x) = (x^2 - 8)^{10}$ when $x = 3$.

5. Find the derivative of $f(x) = \dfrac{14x - 2}{2x + 1}$ when $x = 1$.

6. Find the derivative of $f(x) = \cos(\pi x) + \ln(x^2)$ when $x = 1$.

7. Suppose y is related to x by $x^5 + 4xy^3 - 3y^5 = 2$. Use implicit differentiation to find $\dfrac{dy}{dx}$ when $x = 1$ and $y = 1$.

8. (Maximum—see below.)

9. (Minimum—see below.)

Problems 8 and 9: Find the absolute maximum and minimum values of $y = x^3 - 27x + 10$ on the closed interval $[0, 5]$. MAKE SURE YOU USE THE y VALUES OF THE MAXIMUM AND MINIMUM POINTS FOR YOUR ANSWERS.

The remaining questions contain material from Calculus II, Math 126. If any of these questions are of an unfamiliar type, you should register for Math 126.

10. First compute $\frac{d}{dx}\int_1^x \sqrt{1+t^3}\,dt$, then evaluate the result at $x = 2$.

11. Compute $\int_0^4 \frac{x}{\sqrt{9+x^2}}\,dx$.

12. Use integration by parts ($\int u\,dv = uv - \int v\,du$) to compute $\int_0^1 xe^x\,dx$.

13. An object travels in a straight line so that its speed at time t is $2t^2$ cm/s. How far does it travel between $t = 0$ and $t = 3$?

14. Compute the area bounded by the curves $y = 6x$ and $y = 3x^2$.

15. Find the volume generated when the region bounded by $y = \sqrt{\sin(\pi x)}$ and the x-axis between $x = 0$ and $x = 1$ is rotated around the x-axis.

16. Compute $\int_0^\infty e^{-x}\,dx$.

17. Determine if the series $\sum_{n=1}^{\infty} \frac{3^n}{n^2}$ converges or diverges. Put 0 in the answer box if it converges, 1 if it diverges.

18. Find the radius of convergence of the power series $\sum_{n=0}^{\infty} \frac{1}{n+4}x^n$.