1. (bg222:deriv1)
   Define $f(x) = x\ln(x) + \sin(x^2+1)$. Compute $f'(x)$.

2. (bg222:deriv2)
   Define $f(x) = \ln(x)\sin(x) + \sqrt{x^4+x^2}$. Compute $f'(x)$.

3. (bg222:deriv3)
   Compute each of the following derivatives.

   (a) Compute y' if $y = x^3\left(x^2 - \frac{1}{x}\right)$

   (b) $\frac{d}{dx}\sin(x^2+5)$

   (c) $\frac{d}{dx}\left(x^2 \cdot \cos x\right)$

   (d) $\frac{d}{dx}\left(x^2 \cdot \ln x \cdot \cos x\right)$

4. (bg222:ftoc1)
   Define $f(x) = \int_x^{x^2} e^{t^3} dt$. Compute $f'(x)$. Hint: split the integral into $\int_x^1$ and $\int_1^{x^2}$ and use the Fundamental Theorem of Calculus.

5. (bg222:ftoc2)
   Compute $\frac{d}{dx}\int_x^1 \ln z \; dz$. (Hint: remember the "Fundamental Theorem of Calculus".)

6. (bg222:int1)
   Compute
   $$\int \frac{\ln(\pi x)}{x} dx$$

7. (bg222:int2)
   Compute $\int_e^{e^3} \frac{1}{x\ln(x)} dx$.

8. (bg222:int3)
   Compute $\int_0^{\frac{\pi}{2}} \cos(t) e^{\sin(t)} dt$.

9. (bg222:int4)
Compute $\int e^x \sin(2\pi e^x) dx$

10. (bg222:int5)
Compute $\int_0^x \left(\int_0^t \cos(s) ds \right) dt$.

11. (bg222:int6)
Compute each of the following integrals.

    (a) $\int x^2 \sin(x^3) dx$

    (b) $\int \frac{x^3+\sqrt{x}+\sqrt{\pi}}{\sqrt{x}} dx$

    (c) $\int_{-2}^{3} (x^2 + x + 1) dx$

12. (bg222:tf1)
$\frac{d}{dx}(\frac{1}{x}) = \ln x$.

13. (background:TF)
True or False:

    (a) $\frac{d}{dx}(\frac{1}{x}) = \ln x$

    (b) $\frac{d}{dt} \int_0^t \frac{dx}{1+x^2} = \frac{1}{1+t^2}$

    (c) $\sqrt{x^2 + 9} = x + 3$

    (d) The function $f(x) = \frac{1}{x+4}$ is defined for all values of x except for $x = -4$

    (e) $\int e^{(x^3)} = e^{(x^3)} + C$

    (f) If $f(x) = x^2 \cdot g(x)$ then $f'(x) = 2x \cdot g'(x)$

14. (bg222:optimization)
Which rectangle has the largest area, among all those rectangles for which the total length of the sides is 1?