1. (a) $\dfrac{d}{dx}\left[e^{\sin(\sqrt{e^x})}\right]$

   (b) $\dfrac{d}{dx}\left[\sin(\cos(\tan(x^{3/2}+x)))\right]$

   (c) $\dfrac{d}{dx}\left[xe^{\left(xe^{(xe^x)}\right)}\right]$

2. $x(t) = \cos(2t)$ and $y(t) = \sin(3t)$. Find the equations of the tangent lines at the y intercepts.

3. Let f and g be positive differentiable functions and a and b positive real numbers.

   (a) Write a formula in terms of f and g for $\frac{d}{dx}\sqrt{f(g(x))}$.

   (b) Suppose that $f(a) = b$ and $\frac{d}{dx}\sqrt{f(ax)} = \sqrt{b}$. Write a formula for $f'(a)$.
   Hint: Use part (a) and let $x = 1$.

   (c) When $x = a$ write the equation (involving a and b) for the tangent line to f.

   (d) Write $f(x)$ as a formula involving a and b. (*Difficult.*)

4. A curve Γ is defined by $x^2y + y^2x + 2x + y = \pi$. Find $\frac{dy}{dx}$.

5. Let C be the curve defined by the relation

$$\sin(x^2 + y^2) = e^{2y}$$

   (a) Find $\frac{dy}{dx}$ for C.

   (b) Find the equation of the tangent line to C at the point $(x, y) = (\sqrt{\pi}, 0)$.

   (c) Use the tangent line at $(\sqrt{\pi}, 0)$ to estimate the number a so that $(a, \frac{\pi}{10})$ lies on C.

6. A marble rolls on a flat table along the curve

$$y \ln(xy) = e^{2x-1}$$

   At the point $(1, e)$ the y-coordinate of the marble is changing at π cm/sec. At what rate is the x-coordinate changing? *Hint: differentiate with respect to t.*