92-131 **Final Exam Answers** **Fall 2009**

Brent Sec. 203 & 207

1) $f'(x) = e^x \sec^2(e^x)$ **2)** $s'(x) = \dfrac{3x^2}{\sqrt{1-x^6}}$ **3)** $y' = e^{-4x}(3\cos(3x) - 4\sin(3x))$

4) $g'(t) = \dfrac{t^4 + 3t^2 + 2t}{(t^2+1)^2}$ **5)** $y' = -9x^{-4}\ln x = \dfrac{-9\ln x}{x^4}$ **6)** $f'(x) = \dfrac{\ln x}{2x}$

7) $$f'(x) = \lim_{h\to 0}\frac{f(x+h) - f(x)}{h} = \lim_{h\to 0}\frac{[(x+h)^3+1] - [x^3+1]}{h} = \lim_{h\to 0}\frac{x^3 + 3hx^2 + 3h^2x + h^3 + 1 - x^3 - 1}{h}$$

$$= \lim_{h\to 0}\frac{3hx^2 + 3h^2x + h^3}{h} = \lim_{h\to 0}(3x^2 + 3hx + h^2) = 3x^2$$

8) $\dfrac{dy}{dx} = \dfrac{2xy^2e^{x^2y^2-1}}{1-2x^2ye^{x^2y^2-1}}$, $y = -2x + 3$

9) **a)** $v(t) = 16t - t^3$ **b)** $t = 4$ **c)** $S(t) = 8t^2 - \dfrac{1}{4}t^4 + 2$

10) Let $f(x) = e^{-x^2/2}$.

a) f increases for $x < 0$, and decreases for $x > 0$.
b) $f(0) = 1$ is a relative maximum value.
c) f is concave down for $-1 < x < 1$, there. For $x < -1 \cup x > 1$, f is concave up.
d) $(\pm 1, e^{-1/2})$.
e) Horizontal asymptote $y = 0$. There are no vertical asymptotes.

11) $r = h = 10$ m

12) **a)** $x_{n+1} = x_n - \dfrac{x_n^3 - 3x_n}{3x_n^2 - 3}$ **b)** $x_2 = \dfrac{2x_1^3}{3x_1^2 - 3} = \dfrac{2(9/5)^3}{3(9/5)^2 - 3} = \dfrac{729}{420} \approx 1.735714$