B14-1 Final Exam Parital Answers **December 5, 1994**

These answers are not guaranteed. If in doubt, check with your instructor or TA.

1.

(a) $42x^5 + 15x^{-4} - (1/2)x^{-3/2}$

(b) $3t^2(t^{3/2} - 2t^{-5}) + (t^3 - 3)((3/2)t^{1/2} + 10t^{-6})$

(c) $\dfrac{6x(2x+3) - (3x^2-1)(2)}{(2x+3)^2}$

(d) $5(\sin(3s) + s)^4(3\cos(3s) + 1)$

(e) $(4x^2 + 1)(2)$

2.

(a) $\dfrac{5}{72} - \dfrac{20\sqrt{3}}{27} + \dfrac{7\sqrt{2}}{6}$

(b) Use $u = 1 + \sqrt{x}$; $-(1 + \sqrt{x})^{-2}$

(c) zero

3. B and E

4. The graph of $y = f'(x)$ is negative up to value of x to the left of the y-axis where $f(x)$ attains its minimum value and then it is positive. But there is an inflection point closer to the of the y-axis, but still to the left, in the graph of $y = f(x)$ where the graph of $f'(x)$ attains its maximum value and then it approaches the x-axis asymptotically as $x \to \infty$.

5. 4500 miles per hour.

6. $(\pm\sqrt{3/2}, 7/2)$ are the closest points but $(0, 2)$ is also a candiate.

7. $y' = -3\dfrac{x(x+2y)}{3x^2+2y}$. Tangent line: $y - 2 = -(15/7)(x-1)$. Of course this should be further simplified.

8. $\dfrac{125}{6}$

9. $\dfrac{43}{4}$.

10. Consider $f(x) = \dfrac{x}{x^2-1}$, $f'(x) = -\dfrac{x^2+1}{(x^2-1)^2}$, $f''(x) = \dfrac{2x(x^2+3)}{(x^2-1)^3}$. Find:

(a) Question is badly stated. It should have said *local* maxima and minima. But there are none anyway,

(b) Vertical: $x = -1, x = 1$; horizontal $y = 0$.

(c) Concave down: $(-\infty, -1), (0, 1)$; concave up: $(-1, 0), (1, \infty)$. Inflection point at $(0, 0)$.

(d) Use Maple to check your graph.