PRACTICE FINAL (JONES) - ANSWER KEY

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(1) E
(2) B
(3) C (don't worry about that one)
(4) A (remember that zeros of f' usually, but not always, correspond to local max/min of f)
(5) B ($y = x$ is a S.A. at $\pm\infty$, and $f(0) = 1$)
(6) E
(7) D
(8) A (use the Pythagorean theorem)
(9) A
(10) A
(11) C (l'Hopital's rule)
(12) A
(13) C
(14) E (calculate the first few derivatives and notice the pattern)
(15) E

(16) (i) $-2\sin(x) + C$ (use $\sin(2x) = 2\sin(x)\cos(x)$)
(ii) $-\frac{3}{20}(3-5x)^{\frac{4}{3}} + C$ ($u = 3 - 5x$)
(iii) $\frac{(\sin^{-1} x)^2}{2} + C$ ($u = \sin^{-1} x$)
(iv) $\frac{1}{3}(x^2 + a^2)^{\frac{3}{2}} + C$ ($u = x^2 + a^2$)
(v) $-\frac{1}{\pi}\sin(\frac{\pi}{x}) + C$ ($u = \frac{\pi}{x}$)

(17) (i) $\frac{11}{2}$ (Interpret this question as asking to find the area under the curve of $y = 6 - 9x + 3x^2 = 3(x-1)(x-2)$ from 0 to 3
(ii) $\frac{e^\pi - 1}{\pi}$ ($u = \pi t$)
(iii) $\frac{\pi}{4}$ ($= \tan^{-1}(1) - \tan^{-1}(0)$)
(iv) 2 ($u = \ln(x)$)
(v) 0 (odd function!)

(18) (i) 0 (trick question! This is not a Riemann sum! Use $\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$)
(ii) $\int_0^1 \sqrt{1-x^2}dx = \frac{\pi}{4}$ (quarter of a circle)
(iii) 0 (l'Hopital's rule)
(iv) 0 (l'Hopital's rule, but only applied once!)
(v) 0 (plug it in directly!)

Date: Wednesday, May 5th, 2011.

(19) (i) $\frac{(x^3+1)-x(3x^2)}{(x^3+1)^2}$
(ii) $-2e^{-x^2}+4x^2e^{-x^2}$
(iii) $\left(\frac{\cosh(e^{2x})}{1+e^{4x}}\right)e^x - \frac{\cosh(x^2)}{1+x^4}$
(iv) $x^{-x}\left(-\ln(x)+1\right)$ (logarithmic differentiation)
(v) $-\sin(x)$ (notice the pattern! Also, $50 = 12 \times 4 + 2$)

(20) π (draw a good picture! The volume is the same as the volume of a cone with height 1 and radius 1)
(21) $\pi \int_0^1 (x^3-2)^2 - (x^2-2)^2 dx = \frac{29\pi}{105}$ (washer method)