Name: _____ **Panther ID:** _____

Exam 2 Calculus II Fall 2012

To receive credit you MUST SHOW ALL YOUR WORK.

1. (16 pts) Circle the correct answer (4 pts each):

(a) For the integral $\int \sqrt{9x^2+4}\,dx$, the following substitution is helpful:

(i) $x = \tan\theta$ (ii) $3x = 2\sin\theta$ (iii) $x = 3\sec\theta$ (iv) $3x = 2\tan\theta$ (v) $w = 9x^2+4$

(Don't spend time evaluating the integral. It is not required.)

(b) The partial fraction decomposition for $\frac{x+3}{(x+2)^2(x^2+4)}$ is of the form:

(i) $\dfrac{A}{x+2} + \dfrac{B}{x^2+4}$ (ii) $\dfrac{A}{x+2} + \dfrac{B}{(x+2)^2} + \dfrac{Cx+D}{x^2+4}$ (iii) $\dfrac{x+3}{(x+2)^2} + \dfrac{x+3}{x^2+4}$

(iv) $\dfrac{A}{x+2} + \dfrac{B}{(x+2)^2} + \dfrac{C}{(x+2)^3} + \dfrac{D}{(x+2)^4}$ (v) none of the above

(c) A function $f(x)$ is known to be continuous, positive and concave up when $x \in [-2,2]$. Let T_4 be the trapezoid approximation with 4 subdivisions of the integral $\int_{-2}^{2} f(x)\,dx$. Then compared with the integral, T_4 is an

(i) overestimate (ii) underestimate (iii) exact estimate (iv) cannot tell (more should be known about f)

(d) A function $f(x)$ is known to be continuous, positive and concave up when $x \in [-2,2]$. Let L_4 be the left-point approximation with 4 subdivisions of the integral $\int_{-2}^{2} f(x)\,dx$. Then compared with the integral, L_4 is an

(i) overestimate (ii) underestimate (iii) exact estimate (iv) cannot tell (more should be known about f)

2. (14 pts) Consider the parametric curve given by $x = e^{-t}\cos t$, $y = e^{-t}\sin t$, for $t \in [0, +\infty)$.

(a) (4 pts) Roughly sketch or at least describe in words how the curve looks like.

(b) (10 pts) Find the total length of the curve when $t \in [0, +\infty)$. Obviously, you'll have an improper integral to compute.

3. (18 pts) The equation (in polar coordinates) $r = 2 - 2\sin\theta$ represents a cardioid.

(a) (2 pts) What is the axis of symmetry of the above cardioid?

(b) (6 pts) Sketch the graph of the cardioid in a cartesian coordinate system. Give the cartesian coordinates of the points where the graph intersects the coordinate axis (the intercepts).

(c) (10 pts) Find the value of the y-coordinate of the point(s) on the graph of the cardioid where the tangent line is horizontal.

4. (48 pts) Compute each of the following (12 pts each):

(a) $\displaystyle\int_e^\infty \frac{1}{t(\ln t)^2}\,dt$

(b) $\displaystyle\int \tan^5 x \sec x\,dx$

(c) $\displaystyle\int x^2 e^{2x}\,dx$

(d) $\displaystyle\int_0^3 \frac{x^3}{\sqrt{9-x^2}}\,dx$

5. (14 pts) Use partial fractions (or other method) to compute

$$\int \frac{x+2}{x(x^2+4)}\,dx$$