Staple!

Team:____

Calc 2
MAC2312

Home-C

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Touch: 17Nov2017

Due at **BoC, Tues, 02Mar**. *Fill-in* every *blank* on this sheet. Write **DNE** in a blank if the described object does not exist or if the indicated operation cannot be performed. Do ***not*** approx.: If your result is "$\sin(\sqrt{\pi})$" then write that rather than .9797⋯. Use "$f(x)$ notation" when writing fncs; in particular, for trig and log fncs. E.g, write "$\sin(x)$" rather than the horrible $\sin x$ or $[\sin x]$.

For the essay questions, TYPESET *triple–spaced, grammatical, solutions. A free math-typesetting program is* LaTeX*; it is customizable to individual preference.*

C1: *Abbrevs:* **parm'ize** for "parametrize", **parm'tion** for "parametrization", and **DGPics** for "draw(ing) good pictures".

For $m \in [1, \infty)$, let Ω_m denote the equi-angular spiral which crosses the x-axis at $Q_1 := (1, 0)$ and, one wrap later, at $Q_m := (m, 0)$. (When $m=1$, the "spiral" degenerates into a circle.) Let $\mathbf{P}_m = (\alpha_m, \beta_m)$ be the parm'tion of Ω_m st. $\mathbf{P}_m(0) = Q_1$, $\mathbf{P}_m(2\pi) = Q_m$ and $\mathbf{P}_m(t)$ wraps once whenever t increases by 2π.

So $\alpha_m(t) =$ ________

& $\beta_m(t) =$ ________ .

___ ___ **a** DGPics, computing $L_m := \operatorname{Len}\binom{Q_1 \smile Q_m}{\text{wrap}}$ gives $L_m =$ ____ .

Total-len of Ω_m going in to the origin from Q_1, is $T_m =$ ________ . [*Hint:* As $m \searrow 1$, geometrically you expect $L_m \to ??$ and $T_m \to ??$; **do they?** (Think **l'Hôpital's**.) As $m \nearrow \infty$, geometry tells you to expect $T_m \to ??$, and L_m to be asymptotic to ??. **Are they?**]

___ ___ **b** Fnc $\mathbf{F}(t) := \mathrm{e}^t \cdot (\cos(t), \sin(t))$ parametrizes $\mathbf{\Phi}$, a *Friendly* spiral. For $\tau \in [-\infty, 0)$, let $\mathbf{\Lambda}\langle\tau\rangle$ be the section of $\mathbf{\Phi}$ from Q_1 to $\mathbf{F}(\tau)$. *DGPics*, rotate $\mathbf{\Lambda}\langle\tau\rangle$ about the $y = x+3$ line $\mathbb{L}$, generating a surface-of-revol. whose area is

$\mathcal{A}\langle\tau\rangle =$ ________ .

Hence $\mathcal{A}\langle -\infty\rangle =$ ________ .

___ ___ **c** Let $\mathbf{\Upsilon}$ be the part of $\mathbf{\Phi}$ from $B := \mathbf{F}(-\pi/2)$ to Q_1. Let R be the region up-from $\mathbf{\Upsilon}$ to the x-axis. Let $\mathbb{S}$ be the SoR obtained by rotating R about the x-axis.. DGPics, compute the volume of this SoR.

___ ___ **d** Showing the interesting steps, compute from $\mathbf{F}()$ the arclength parametrization $\mathbf{A}(s) = (x(s), y(s))$, of the spiral, satisfying that $\mathbf{A}(0) = \mathbf{F}(0)$. Indeed,

$x(s) =$ ________ .

___ ___ **e** Create some *interesting* mathematical problem concerning these spirals. Elegantly solve the problem that you created, drawing nice pictures. *Show off!*

C2: *Henceforth, show no work. Simply fill-in each blank on the problem-sheet.*

α The quotient and remainder polynomials,

$q(x) =$ ________

& $r(x) =$ ________ ,

satisfy $B = [q \cdot C] + r$ and $\operatorname{Deg}(r) < \operatorname{Deg}(C)$, where $B(x) := 6x^6 + 3x^5 - 6x^4 + 2x^3 + 8x^2 + 1$ and $C(x) := 3x^3 - 3x + 3$.

β Solve prob. **#16** *P.548*, having replaced "70ft" by "80ft". So the total hydrostatic force on the dam is $\mathbf{\Gamma}\cdot$ ________ ,

where $\mathbf{\Gamma} :: \frac{\text{lb}}{\text{ft}^3}$ denotes the weight-density of water.

γ For $M \in \mathbb{R}$, let $\overline{y_M}$ denote the y-coord of the centroid of R_M, the region in the lying above parabola $y = x^2$ and below line $y = 1 + Mx$, whose 1st quadrant-intersection has x-coord $\mathbf{U} =$ ________ .

Fraction $\overline{y_0} =$ ________ . In terms of M and $\mathbf{U}$, $\operatorname{Area}(R_M) =$ ________ and

$\overline{y_M} = \Big[$ ________ $\Big] / \operatorname{Area}(R_M)$.

[*Hint:* The last two blanks are OTForm *Polynomial*$(M, \mathbf{U})$.]

End of Home-C

C1:	___ ___ ___	195pts
C2:	___ ___	95pts
Un- or poorly stapled:	___	−5pts
Total:	___ ___ ___	290pts

Honor Code: *"I have neither requested nor received help on this exam other than from my team-mates and my professor (or his colleague)."* *Name/Signature/Ord*

________ Ord: ____

________ Ord: ____

________ Ord: ____