Review Problems for Exam 1, 192

The first exam will cover material up to and including section 7.4 of Thomas & Finney. Below are some problems covering that material. Your exam will contain problems of the same type, on the same level. Thus you may find it useful to look over these problems and check that you can do them. There will a review session to discuss these problems and other material in preparation for the first exam*. This review session will take place on:

Sunday, October 10, at 1:00 PM, in Hill 525 (Busch)

Note: To make best use of this review session, try all of the problems yourself before you attend.

1. Compute:
   a) $\tan(\arctan(3))$
   b) $\arctan(\tan(\frac{5\pi}{4}))$
   c) $\sec(\arcsin(\frac{5}{7}))$
   d) $\ln\left(\frac{(e^2)^5}{e^3}\right)$

2. Compute $\frac{dy}{dx}$:
   a) $y = \arcsin(x^3 + 7)$
   b) $y = 2^{\sec x}$
   c) $y = \ln\left(\frac{x^2}{e^{3x}}\right)$
   d) $e^{xy} + 3x^2y = 0$

3. Perform the indicated integrations.
   a) $\int_0^1 \frac{x^2}{4 - x^3}\, dx$
   b) $\int_0^{\frac{\pi}{4}} (\sec x)^2 (\tan x)^2\, dx$ (simplify your answer)
   c) $\int_0^{\ln 3} e^{-2x}\, dx$ (simplify your answer)

4. Consider the function $G(x) = xe^x$.
   a) What is $\lim_{x\to\infty} G(x)$?
   b) What is $\lim_{x\to-\infty} G(x)$?
   c) Compute $G'(x)$. Where is $G'(x) = 0$?

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* Attendance at the review session is **not** mandatory

d) Compute $G''(x)$. Where is $G''(x) = 0$?

e) Use all of the information above to sketch the graph of $y = G(x)$. Be sure to indicate any local extrema or inflection points, all regions of increase and decrease, and all regions of concavity.

Alternately, perform a similar analysis for $H(x) = \dfrac{\ln x}{x}$ (replacing the "$\lim_{x\to-\infty}$" in b) by "$\lim_{x\to 0^+}$") and then graph $y = \dfrac{\ln x}{x}$.

5. The number of bacteria increase at a rate proportional to the number present. Suppose there are 100 bacteria at 12 noon, and 500 present 3 hours later. What is the doubling time (the time need for the number of bacteria to double) of this type of bacteria?

6. Integrate:

a) $\displaystyle\int x^3 \ln x \, dx$

b) $\displaystyle\int_{-\pi}^{0} \sin 3x \cos 2x \, dx$ (simplify your answer)

c) $\displaystyle\int \frac{dx}{1+4x^2}$

d) $\displaystyle\int \frac{dx}{\sqrt{9x^2-6x-3}}$ Alternately: $\displaystyle\int \frac{dx}{\sqrt{9x^2-12x}}$

e) $\displaystyle\int e^{\sqrt{x}} \, dx$

Every student should have a *few* digits of e, so here are 1700 of them:

$e = 2.$

71828 18284 59045 23536 02874 71352 66249 77572 47093 69995 95749 66967 62772 40766 30353 54759 45713 82178 52516 64274
27466 39193 20030 59921 81741 35966 29043 57290 03342 95260 59563 07381 32328 62794 34907 63233 82988 07531 95251 01901
15738 34187 93070 21540 89149 93488 41675 09244 76146 06680 82264 80016 84774 11853 74234 54424 37107 53907 77449 92069
55170 27618 38606 26133 13845 83000 75204 49338 26560 29760 67371 13200 70932 87091 27443 74704 72306 96977 20931 01416
92836 81902 55151 08657 46377 21112 52389 78442 50569 53696 77078 54499 69967 94686 44549 05987 93163 68892 30098 79312
77361 78215 42499 92295 76351 48220 82698 95193 66803 31825 28869 39849 64651 05820 93923 98294 88793 32036 25094 43117
30123 81970 68416 14039 70198 37679 32068 32823 76464 80429 53118 02328 78250 98194 55815 30175 67173 61332 06981 12509
96181 88159 30416 90351 59888 85193 45807 27386 67385 89422 87922 84998 92086 80582 57492 79610 48419 84443 63463 24496
84875 60233 62482 70419 78623 20900 21609 90235 30436 99418 49146 31409 34317 38143 64054 62531 52096 18369 08887 07016
76839 64243 78140 59271 45635 49061 30310 72085 10383 75051 01157 47704 17189 86106 87396 96552 12671 54688 95703 50354
02123 40784 98193 34321 06817 01210 05627 88023 51930 33224 74501 58539 04730 41995 77770 93503 66041 69973 29725 08868
76966 40355 57071 62268 44716 25607 98826 51787 13419 51246 65201 03059 21236 67719 43252 78675 39855 89448 96970 96409
75459 18569 56380 23637 01621 12047 74272 28364 89613 42251 64450 78182 44235 29486 36372 14174 02388 93441 24796 35743
70263 75529 44483 37998 01612 54922 78509 25778 25620 92622 64832 62779 33386 56648 16277 25164 01910 59004 91644 99828
93150 56604 72580 27786 31864 15519 56532 44258 69829 46959 30801 91529 87211 72556 34754 63964 47910 14590 40905 86298
49679 12874 06870 50489 58586 71747 98546 67757 57320 56812 88459 20541 33405 39220 00113 78630 09455 60688 16674 00169
84205 58040 33637 95376 45203 04024 32256 61352 78369 51177 88386 38744 39662 53224 98506 54995 88623 42818 99707 73327