

Solutions to Exam IIIA Fall 2003

1. E
2. E
3. D
4. E
5. C
6. E
7. E
8. C
9. C
10. E
11. D
12. .
  - (a)  $k = \frac{\ln 4}{2}$
  - (b) 1,250 bacteria
13. .
  - (a)  $[-1,1]$
  - (b)  $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$
  - (c)  $-\frac{\pi}{2}$
  - (d) 1
  - (e)  $\frac{\sqrt{15}}{4}$
  - (f)  $\frac{1}{4}$
14.  $3\frac{1}{4} km$
15. max 16; min 0
16. .
  - (a) If  $f$  is continuous on  $[a, b]$  and  $f$  is differentiable on  $(a, b)$  then there is a  $c \in (a, b)$  such that  $f'(c) = \frac{f(b) - f(a)}{b - a}$ .
  - (b) If  $f$  is continuous on a closed, bounded interval, then  $f$  attains its absolute maximum and absolute minimum on the interval.
17.  $\mathbf{r}(t) = \left(\frac{1}{6}t^3 + t - \frac{1}{6}\right) \mathbf{i} + \left(\frac{1}{2}t^2 - t + \frac{5}{2}\right) \mathbf{j}$

18. .

(a)  $F(x) = \ln |x| - \frac{1}{3}x^{-3} + C$

(b)  $F(x) = \frac{3}{5}x^{5/3} + 3x^{2/3} + C$

(c)  $F(x) = -\cos x + \tan^{-1} x + C$

19.  $\frac{7}{8}$

20. .

(a)  $\frac{2x}{1+x^2}$

(b)  $2^{\tan x}(\ln 2)(\sec^2 x)$