Carnegie Mellon University **MSCF Program** **Math Prep**

Selected Answers to Review Problems

1. (a) $\frac{1}{3}\ln\left(\frac{5\pm\sqrt{13}}{2}\right)$
   (b) $\frac{1}{e^4-2}$
2. (a) e^6
   (b) $-\frac{1}{2}$
   (c) 0
   (d) 2
4. (a) $e^{-x^2}(3x^2-2x^4)$
   (b) $\frac{(1+x^2)\left(\frac{1}{2\sqrt{x}}\right)-\sqrt{x}(2x)}{(1+x^2)^2}$
   (c) $(1+x^8)^x\left[\ln(1+x^8)+\frac{8x^8}{1+x^8}\right]$
5. $2\times 2\times 2$
6. $-\frac{5}{4}$
7. $f(.98)\approx 3+3(.02)+2(.02)^2=3.0608, \quad |\text{error}|\leq \frac{7}{6}(.02)^3$
8. $\frac{31!}{14!}$
9. $-\frac{1}{2}\sum_{k=1}^{\infty}\frac{x^{4k}}{k}$
10. (a) -3
    (b) -9
11. (a) $\frac{1}{2}(x^2+1)\ln(x^2+1)-\frac{1}{2}(x^2+1)+C$
    (b) $\frac{1}{2}(x+1)^2-2(x+1)+\ln|x+1|+C$
    (c) $\frac{1}{5}e^{5x}-\frac{1}{3}e^{-3x}+C$
    (d) $-\frac{1}{2}(x^2+1)^{-1}+C$
12. (a) $\frac{1}{2}$
    (b) $\frac{27}{2}+\ln 4$
    (c) $\frac{1}{3}\ln 9$
13. Diverges
14. $p>\frac{1}{2}$
15. (a) Converges
    (b) Converges

(c) Diverges

(d) Diverges

(e) Converges

16. (a) $-3x^2e^{-x^6}$

(b) $\sqrt{(\ln x)^4 + x^3}\left(\frac{1}{x}\right) + \int_1^{\ln x} \frac{3x^2}{2\sqrt{t^4+x^3}}dt$

(c) $\ln(1+\sin^{10} x)\cos x - \ln(1+x^5)\frac{1}{2\sqrt{x}}$

18. 10

20. $2\ln 10 + 3\left(2\ln 10 + \frac{4}{10}\right) - \frac{24}{10}$

21. (a) $\int_0^1 \int_{-\sqrt{y}}^{\sqrt{y}} f(x,y)dxdy$

(b) $\int_0^2 \int_{3x}^6 f(x,y)dydx$

22. (a) $\frac{1}{20}$

(b) $\frac{4\pi}{3}$