MT Review Even Answers

Ch10 # 22

$$\lim_{n\to\infty} \frac{\ln(n^2+1)}{\ln(n^3+1)} = \lim_{x\to\infty} \frac{\ln(x^2+1)}{\ln(x^3+1)} = \lim_{x\to\infty} \frac{\frac{2x}{x^2+1}}{\frac{3x^2}{x^3+1}} = \lim_{x\to\infty} \frac{2x^4+2x}{3x^4+3x^2} = \boxed{\frac{2}{3}}$$

Ch10 #38

$\pi\left(\frac{1}{4}\right)^2 + \pi\left(\frac{1}{8}\right)^2 + \pi\left(\frac{1}{16}\right)^2 + \cdots$ geometric series

$a = \frac{\pi}{16}$, $r = \frac{1}{4}$ so sum is $\frac{\pi}{16} \cdot \frac{4}{3} = \boxed{\frac{\pi}{12}}$

Ch10 #46

comparison $\frac{1}{n - \ln n} > \frac{1}{n}$ diverge by $p=1$ so $\boxed{\text{diverges}}$

Ch10 #80

ratio test $\lim_{n\to\infty} \frac{(n+1)e^{-.02(n+1)}}{n e^{-.02n}} = \lim_{n\to\infty} \frac{(n+1)}{(n)e^{.02}} = \frac{1}{e^{.02}} < 1$

$\boxed{\text{converges}}$

Ch10 # 128

$$F(x) = \int_0^x \frac{\left(1 + t + \frac{t^2}{2!} + \cdots\right) - 1}{t}$$

$$= \int_0^x 1 + \frac{t}{2!} + \frac{t^2}{3!} + \cdots$$

$$= x + \frac{x^2}{2\cdot 2!} + \frac{x^3}{3\cdot 3!} + \cdots = \boxed{\sum_{n=1}^{\infty} \frac{x^n}{n\cdot n!}}$$

Ch12 # 16

a) F $(0,0,0) + t(1,1,1)$ is same as $(1,1,1) + t(1,1,1)$

b) F $(0,0,0) + t(1,1,1)$ same as $(0,0,0) + t\left(\frac{1}{2},\frac{1}{2},\frac{1}{2}\right)$

c) F same example as (a)

d) F $(0,0,0) + t(1,1,1)$ is parallel to $(1,0,0) + t\left(\frac{1}{2},\frac{1}{2},\frac{1}{2}\right)$

e) T If two lines are parallel their direction vectors are parallel

↳ by page 638, this implies $w_1 = \lambda w_2$

MT Review Even Answer (cont)

Ch 12 #32 (b) is scalar since dot product

Ch 12 #52 Solving both equations for z, and setting them equal we see line is given by $y = \frac{-4}{3} + \frac{2}{3}x$, $z = \frac{7}{3} - \frac{5}{3}x$
To put in more standard form, take $x = t$ to get
$r(t) = (0, \frac{-4}{3}, \frac{7}{3}) + (1, \frac{2}{3}, \frac{-5}{3})t$

Ch 14 #52 $f_x = 3x^2 - y$ c.p. $x = \frac{1}{3}$ $y = \frac{1}{3}$
$f_y = -x - 2y + 1$ $x = -\frac{1}{2}$ not in domain
$D = -6x - 1 < 0$ at $x = \frac{1}{3}$ so saddle.
So max & min must be on boundary
$x = 0$ $0 \le y \le 1$ $f(0,y) = -y^2 + y$ max $f(0, \frac{1}{2}) = \frac{1}{4}$ min $f(0,0) = f(0,1) = 0$
$x = 1$ $0 \le y \le 1$ $f(1,y) = 1 - y^2$ $\boxed{\text{max } f(1,0) = 1}$ min $f(1,1) = 0$
$y = 0$ $0 \le x \le 1$ $f(x,0) = x^3$ max $F(1,0) = 1$ min $f(0,0) = 0$
$y = 1$ $0 \le x \le 1$ $F(x,1) = x^3 - x$ max $f(0,1) = f(1,1) = 0$ $\boxed{\text{min } f(\frac{1}{\sqrt{3}}, 1) = \frac{-2}{3\sqrt{3}}}$