Test 3 Review

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M.C. part

#1 $(2x^3 + 3x^2 + 4x - 10) \div (x+1)$

-1	2	3	4	-10
		-2	-1	-3
	2	1	3	$\boxed{-13}$

$\boxed{-13}$ → Remainder $= -13$

Quotient : $\boxed{2x^2 + x + 3}$

#2 $f(x) = 22x^7 + 88x^3 + 2x - 11$

Possible rational zeros $= \frac{\boxed{p}}{\boxed{q}}$

$\boxed{p}$ → Factor of -11

$\boxed{q}$ → Factor of 22

Factors of $-11 = \pm 1, \pm 11$

Factors of $22 = \pm 1, \pm 2, \pm 11, \pm 22$

List $= \boxed{\left\{ \pm 1, \pm \frac{1}{2}, \pm \frac{1}{11}, \pm \frac{1}{22}, \pm 11, \pm \frac{11}{2} \right\}}$

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#3 V.A.

1. Factor
2. Cancel
3. Set bottom = 0

$$f(x) = \frac{x^2+5x-14}{x^2-2x-8} = \frac{(x+7)(x-2)}{(x-4)(x+2)}$$

$(x-4)(x+2)=0 \rightarrow \boxed{x=4;\ x=-2}$ V.A.

#4 H.A.

- deg top = deg bottom $\rightarrow y = \frac{\text{leading coeff. top}}{\text{leading coeff. bottom}}$
- deg top < deg bottom $\rightarrow y = 0$
- deg top > deg bottom $\rightarrow$ None

$$f(x) = \frac{x^2+4x+6}{8-x^2}$$

deg top = 2 = deg bottom

$$\boxed{y = \frac{1}{-1} = -1} \rightarrow \text{H.A.}$$

#5 $\dfrac{-8}{x^2+2x-3} \boxed{< 0}$ $\rightarrow$ below x-axis

Solution set: $\boxed{(-\infty,-3) \cup (1,\infty)}$

#6 $f(x) = \frac{6}{x-8}$; $g(x) = \frac{5}{2x}$

$$(f \circ g)(x) = f(g(x)) = \frac{6}{\frac{5}{2x} - \frac{8 \cdot 2x}{1 \cdot 2x}}$$

$$= \frac{6}{\frac{5 - 16x}{2x}} = \frac{6}{1} \cdot \frac{2x}{5-16x}$$

$$\boxed{(f \circ g)(x) = \frac{12x}{5 - 16x}}$$

#7 Find inverse function of $f(x) = 5x^3 - 8$

$y = 5x^3 - 8$ (Replace $f(x)$ by y)

→ Solve for x

→ $y + 8 = 5x^3$ → $\frac{y+8}{5} = x^3$ → $x = \sqrt[3]{\frac{y+8}{5}}$

→ $y = \sqrt[3]{\frac{x+8}{5}}$ → $\boxed{f^{-1}(x) = \sqrt[3]{\frac{x+8}{5}}}$

#8 $e^{-t} = 216$ → Log equation

exp: $-t$; base: e ; number: 216

→ $\log_e 216 = -t$ → $\ln 216 = -t$

#9 $\log_w Q = 10$ → Exp equation

Q: #, 10: Exp, w: base

$w^{10} = Q$

#10 $n(t) = 311\, e^{0.008t}$

t = # of years since 1960.

# of cases in the year 2000 → $t = 40$

$n(40) = 311 \cdot e^{0.008 \cdot (40)} \approx 428.28$

$= 428$

#11 Given $\log_b A = 3.584$; $\log_b B = 0.3$

Find $\log_b \frac{A}{B} = \log_b A - \log_b B$

Quotient Rule

$= 3.584 - 0.3 = \boxed{3.284}$

#12 $\frac{1}{2}\log_a x + 4\log_a y - 2\log_a x$

Power Rule

$= \log_a x^{\frac{1}{2}} + \log_a y^4 - \log_a x^2$

$= \log_a \left(\frac{x^{\frac{1}{2}} \cdot y^4}{x^2} \right) = \log_a \left(\frac{y^4}{x^{2-\frac{1}{2}}} \right)$

Product & Quotient

$= \log_a \left(\frac{y^4}{x^{3/2}} \right)$