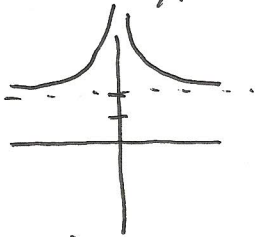


Math III - Review for Exam 2 - example problem solutions

1. $f(x) = \frac{1}{x^2} + 2$



Domain $\{x | x \neq 0\}$

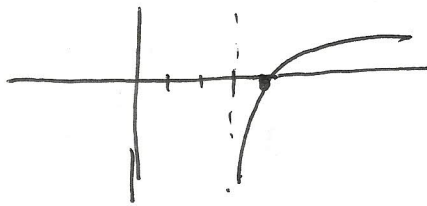
Range $\{x | x > 2\}$

HA: $y = 2$

VA: $x = 0$

even function

$g(x) = \ln(x-3)$



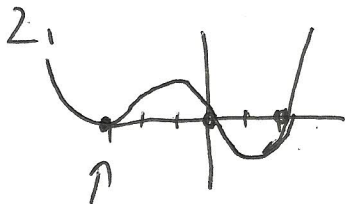
Domain $\{x | x > 3\}$

Range $\{ \text{all reals} \}$

no HA

VA: $x = 3$

neither odd nor even



$$f(x) = (x+3)^2 \cdot x(x-2)$$

$$= x(x+3)^2(x-2)$$

mult 2: touch,
not cross

3a) Local max: $1\frac{1}{2}, 3\frac{1}{2}$ Local min: $-3\frac{1}{2}, -1\frac{1}{4}$

b) No abs max or abs min

c) Zeros: $-2, -1, 0, 1, 2$

d) Min degree: 5 (there are 4 turning points)

e) Sign of $a = \text{neg}$



4. $f(x) = \sqrt{2x-5} + 3$

to get inverse:

$$y = \sqrt{2x-5} + 3$$

$$(y-3)^2 = 2x-5$$

$$\frac{(y-3)^2 + 5}{2} = \frac{2x}{2}$$

$$x = f^{-1}(y) = \frac{(y-3)^2 + 5}{2}$$

$$y = f^{-1}(x) = \frac{(x-3)^2 + 5}{2} \leftarrow \text{avoid "repeat"}$$



Domain of $f(x)$: $\{x | x \geq \frac{5}{2}\}$

Domain of $f^{-1}(x)$: $\{x | x > 3\}$

5. factor!

$$3) \begin{array}{r} 1 \quad -4 \quad 5 \quad -8 \quad 6 \\ \hline \end{array} \quad (x-3)$$

$$\begin{array}{r} 3 \quad -3 \quad 6 \quad -6 \\ \hline 1) \begin{array}{r} 1 \quad -1 \quad 2 \quad -2 \quad 0 \\ \hline \end{array} \\ \hline 1 \quad 0 \quad 2 \quad 0 \end{array}$$

factor more $x^3 - x^2 + 2x - 2$

try $x=1 \rightarrow (x-1)$

$$1 \quad 0 \quad 2 \quad 0 \leftarrow x^2 + 2$$

$$f(x) = (x-3)(x-1)\underbrace{(x^2+2)}_{\text{factor}} = (x-3)(x-1)(x+i\sqrt{2})(x-i\sqrt{2})$$

6. $g(x) = ca^x$

$$g(-1) = 3/4 \Rightarrow 3/4 = ca^{-1}$$

$$\frac{3}{4} = \frac{3}{4} \cdot \frac{1}{a} = a^{-3}$$

$$g(2) = 6 \Rightarrow 6 = ca^2$$

$$g(2) = c \cdot 2^2 = 6; c = \frac{6}{4} = \frac{3}{2}$$

$$2^{-3} = \frac{1}{8} = a^{-3}, a = 2$$

$$g(x) = \frac{3}{2}(2^x)$$

7. a) $A = 2000 \left(1 + \frac{0.08}{12}\right)^{12(20)} = 9853.61$

b) $A = 2000 e^{0.08(20)} = 9906.06$

8. $dB = 10 \log \frac{I}{I_0}$

$$35 = 10 \log \frac{I}{I_0}$$

$$3.5 = \log \frac{I}{I_0}$$

$$\frac{I}{I_0} = 10^{3.5} = 3162 \text{ (over 3000 times greater)}$$