

(10) ① Sketch

$$y = f(x) = x^2 + 3x - 1$$

Show how you get the vertex and plot at least 5 points including the vertex.

(10) ② a) Revenue R is defined as the unit price p of a product, times the no. x of units sold.

Suppose $p = -\frac{1}{5}x + 6$, $0 \leq x \leq 30$. Express the revenue R as a function of the no. of units sold.

b) Find the maximum revenue possible in part a).

(15) ③ Sketch

$$y = f(x) = \frac{x^2 - x - 6}{x^2 - x - 2}$$

Include all intercepts, table of values and asymptotes. Hint: Factor the numerator and denominator.

(10) ④ a) Let $f(x) = x^2 + 3$, $g(x) = \sqrt{x+1}$. Find (and simplify) $(f \circ g)(x)$, and its domain.

b) Now find different functions f, g such that

$$H = f \circ g \text{ if } H(x) = (x^3 + 2x - 5)$$

[$f(x) \neq x$, $g(x) \neq x$]

(15) ⑤ a) Let $y = f(x) = 2x^3 - 5$.

Solve for $f^{-1}(x)$ algebraically.

b) Sketch $y = g(x) = x^2 + 2$, $x \geq 0$ and $y = g^{-1}(x)$ on the same set of axes.

Label each one.

(5) ⑥ Sketch $y = 3^x - 1$.

(5) ⑦ The power of a battery is

$$P = 50e^{-t/300}$$

Find the power, in watts, when $t = 378$ days.

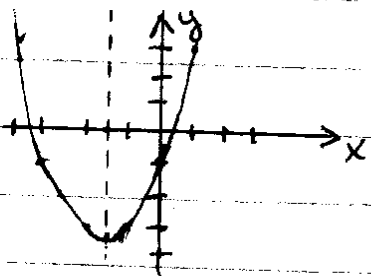
(Use calculator)

MAC 1105 EXAM IV KEY (SU'09)

① $y = f(x) = x^2 + 3x - 1$, $f(6) = -1$
 $x = -\frac{3}{2(1)} = -\frac{3}{2}$

$y_v = f(-1.5) = (-1.5)^2 + 3(-1.5) - 1 = -3.25$

x	y
-1	-3
1	3



② a) $R = px = (-\frac{1}{5}x + 6)x$
 OR $R = -\frac{1}{5}x^2 + 6x$

b) $x = -\frac{6}{2(-\frac{1}{5})} = 15$

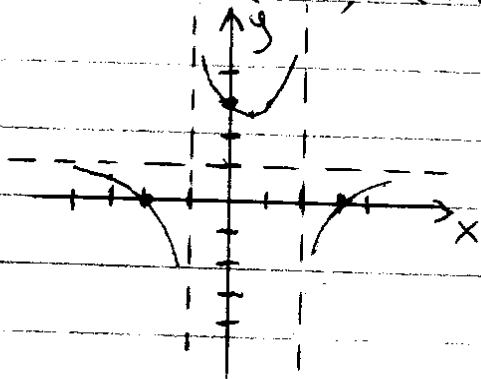
$R_{max} = -\frac{1}{5}(15)^2 + 6(15) = 45$

③ $(x-3)(x+2) = 0 \Rightarrow x = 3, -2$
 $y_{int} = f(0) = \frac{-6}{-2} = 3$ (intercepts)

$y = \frac{1}{x} = 1$ (HA)
 $x^2 - x - 2 = 0$

$(x-2)(x+1) = 0 \Rightarrow x = 2, -1$ (VA)

x	y
-2	0
-1	4.2
1	2.8
2	3
4	6
-3	4



④ b) $f(x) = x^{3/2}$

$g(x) = x^3 + 2x - 5$

⑤ a) $y = 2x^3 - 5 = f(x)$

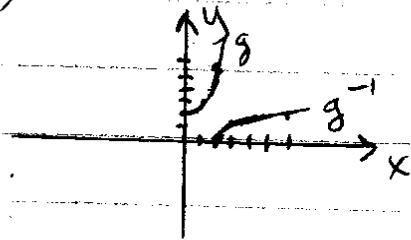
$x = \sqrt[3]{\frac{y+5}{2}}$ $\Rightarrow x+5 = 2y^3$

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

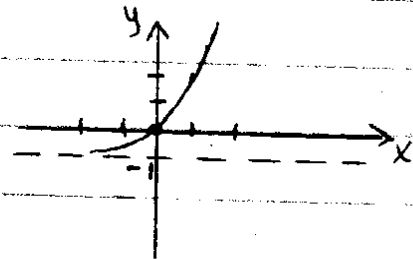
$y = \sqrt[3]{\frac{x+5}{2}} = f^{-1}(x)$

⑤ b) $y = x^2 + 2, x \geq 0$

x	y
0	2
1	3
2	6



x	y
-2	-8/9
-1	-2/3
0	0
1	2
2	8



⑦ $50e^{-378/300} = 50e^{-1.26} \approx 4.1827$

④ a) $(f \circ g)(x) = f(\sqrt{x+1})$
 $= (\sqrt{x+1})^2 + 3$

$= x+1+3 = x+4$

domain: $x \geq -1$