MTH 111 Exam 1 Practice Answers

2.1. $f(5) = 3 \cdot 5^2 - 2 \cdot 5 = 65$.

2.2. The domain of f is the set of all real numbers other than 0.

2.3. f is decreasing on the intervals [-2,0] and [1,4].

2.4. Carefully plotting the graph of $y = x^3 - 3x - 1$ on your graphing calculator for say x between -2 and 2, and then x between -10 and 10, shows that there are three crossings of the x-axis and hence 3 zeros of the function $f(x) = x^3 - 3x - 1$.

2.5. $4x - 6y = 7$ is equivalent to $6y = 4x - 7$ and to $y = \frac{4}{6}x - \frac{7}{6}$ so the slope is $4/6 = 2/3$.

2.6. The line with equation $y - 2 = 3(x - 5)$ has slope 3, so any line parallel to it will also have slope 3. One form of the equation for a line with slope 3 passing through the point (1,2) is $y - 2 = 3(x - 1)$, another is $y = 3x + 1$.

2.7. Equation: $(x - 3)^2 + (y - 6)^2 = 4^2$.

2.8. The function $f(x) = x^2 - x$ is neither odd nor even. You can see this most easily from its graph, but also $f(-x) \neq f(x)$ since $x^2 + (-x) \neq x^2 - x$ and $f(-x) \neq -f(x)$ since $x^2 + (-x) \neq -(x^2 - x)$.

2.9. $(f \circ g)(w) - (g \circ f)(w) = f(g(w)) - g(f(w) = (w + 7)^2 + 1 - (w^2 + 1 + 7)$. You can simplify this to $(w + 7)^2 + 1 - (w^2 + 8) = w^2 + 14w + 49 + 1 - w^2 - 8 = 14w + 42$.

2.10. origin only. Replacing x by $-x$ and y by $-y$ preserves the equation: $(-x)(-y) = -3$ is the same as $xy = -3$. You can also see this from a graph.

2.11. $\sqrt{-25} + \sqrt{-49} = 5i + 7i = 12i$.

2.12. Completing the square, we get $y = 2(x^2 + \frac{3}{2}x + \frac{1}{2}) = 2(x^2 + \frac{3}{2}x + \frac{9}{16} - \frac{1}{16}) = 2(x + \frac{3}{4})^2 - \frac{1}{8}$. From this we find that the x-coordinate of the vertex is $-\frac{3}{4}$ and the y-coordinate is $-\frac{1}{8}$. We can also use formulas on p. 193: x-coordinate is $-3/4$, y-coordinate is $2(-3/4)^2 + 3(-3/4) + 1 = -1/8$. (NOTE: You will not asked to do a problem this complicated on the exam.)

2.13. Using the quadratic formula, solutions are $\frac{-1 \pm \sqrt{1-4}}{2}$ or $-\frac{1}{2} + \frac{\sqrt{3}}{2}i$ and $-\frac{1}{2} - \frac{\sqrt{3}}{2}i$, a pair of complex numbers.

2.14. The product is $x^5 - 2x^3 + 3x^2 + x^4 + 5x - 4$.

2.15. $\frac{f(a+h)-f(a)}{h} = \frac{[6(a+h)^2-1]-[6a^2-1]}{h} = \frac{12ah+h^2}{h} = 12a + h$ if $h \neq 0$.

2.16. a) $f(x) = (g \circ h)(x) = g(h(x))$ with $h(x) = x^2 + 3$ and $g(x) = x^4 - 1$.

b) $f(x) = (g \circ h)(x) = g(h(x))$ with $h(x) = (3x + 7)^2$ and $g(x) = 1/x$.

(Other answers are possible.)

2.17. a) Let C be the cost. Then $C = f(d) = 2.00 + 1.23d$.

b) Distance travelled in time t is $20t$, so $C = g(t) = 2.00 + 1.23 \cdot 20t$.

2.18. a) Not linear. Changing t by .5 does not always give the same change in v.

b) Linear. $v = 0.6t + 1.4$ (Use any two (t, v) pairs to compute the slope.)

2.19. The circle has its center at the midpoint of the line joining the two given points, so the center is at (2,6). The radius is half the length of this segment or $\frac{\sqrt{6^2+8^2}}{2} = 5$. Equation: $(x - 2)^2 + (y - 6)^2 = 25$.

2.20. $g(x) = |x + 4| + 6$.

2.22. Quotient is $x^2 + 2x + 7$, remainder is 24.

2.23. a) $a^2b + ab^2 = ab(a + b)$ b) $ab + b = b(a + 1)$ c) $a^3 - 8 = (a - 2)(a^2 + 2a + 4)$.