Some answers to review sheet for 2nd Midterm
Math 1100
8 March 2004
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Remember to bring a #2 pencil for the actual test!!!

1.

2.

a) domain=[0,∞) range=[0,∞)
b) domain=(-∞,∞) range={1, −1, 3, −3, ···}
c) domain=[0,∞) range={1, 3, 5, ···}

3. Let

\[
x = \text{weight (ounces)}
\]
\[
c(x) = \text{cost (dollars)}
\]
then

\[
c(x) = 0.14 + 0.23[x]
\]

4.

If we write \( f_T(x) \) for the transformed function, then

\[
f_T(x) = -\left(\frac{x}{2}\right)^3 + 3
\]

5. Note: there is more than one possible sequence of transformations. One is as follows:

- Shift three units to the right, giving \( y = (x - 3)^2 \)
- Reflect about \( x \)-axis, giving \( y = -(x - 3)^2 \)
- Shrink vertically by a factor of two, giving \( y = -\frac{1}{2}(x - 3)^2 \)
- Move up seven units, giving \( y = -\frac{1}{2}(x - 3)^2 + 7 \)
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6.

a) \((f + g)(9) = \sqrt{9} + (9 - 3) = 9\)

b) The domain of \(f/g\) is \([0,3) \cup (3,\infty)\)

7.

a) \(g(-5) = (-5)^2 = 25\), so \((f \circ g)(-5) = \sqrt{25} = 5\)

b) The domain of \(f \circ g\) is \((-\infty,2) \cup [9,\infty)\)

8.

\((g \circ f)(t)\) is the perceived temperature at time \(t\)

9.

\[2x^2 + 4x + 1 = 2(x^2 + 2x) + 1 = 2(x^2 + 2x + 1) - 1 = 2(x + 1)^2 - 1\]

So shift left 1 unit, then stretch vertically by a factor of 2, then move down 1 unit.

10.

The vertex occurs at \(t = \frac{-9.6}{2(4.8)} = 1\)

So the maximum height is \(-4.8(1)^2 + 9.6(1) + 9.6\) or 14.4m.

11.

\(x\)-coordinate of vertex is \(\frac{-4}{2(-2)} = 1\)

so the \(y\)-coordinate is \(-2(1)^2 + 4(1) + 7\) or 9.
12. 

\[ f(0) = -7 \]
\[ f(1) = -5 \]
\[ f(2) = -1 \]
\[ f(3) = 11 \]

So by the Intermediate Value Theorem there’s a zero in the interval \([2, 3]\).

13. Down and to the right; up and to the left.

14. quotient = \(x^2 + 2x - 1\); remainder = \(-2x + 8\).

15. Divide \(2x^3 + x^2 - 5x + 2\) by \(x - 1\) to get \(2x^2 + 3x - 2\). Use the quadratic formula to solve \(2x^2 + 3x - 2 = 0\), getting \(x = \frac{1}{2}\) or \(x = -2\). So

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

16. Let

\[ f(x) = x^3 + x + 2 \]

a) \(1, -1, 2, -2\)

b) \(-1\)

c) \((x + 1) \left(x - \left(-\frac{1}{2} + i\frac{\sqrt{7}}{2}\right)\right) \left(x - \left(-\frac{1}{2} - i\frac{\sqrt{7}}{2}\right)\right)\)

17.

\[
(x - 2)(x - (1 + i))(x - (1 - i)) = (x - 2)((x - 1) - i)((x - 1) + i)
\]
\[
= (x - 2)((x - 1)^2 - i^2)
\]
\[
= (x - 2)((x - 1)^2 + 1)
\]
\[
= (x - 2)(x^2 - 2x + 2)
\]
\[
= x^3 - 4x^2 + 6x - 4
\]