MATH 16A: Solutions to Homework # 1 (due September 6)

0.1:19 If $f(x) = x^2 - 2x$ then $f(a+1) = (a+1)^2 - 2(a+1) = a^2 - 1$ and $f(a+2) = (a+2)^2 - 2(a+2) = a^2 + 2a$.

0.1:42 For the function in Figure 15, we have $f(x) \geq 0$ if and only if $x \geq 9$ or $-1 \leq x \leq 5$.

0.1:50 For the function $g(x) = (x^2+4)/(x+2)$ we have $g(\frac{2}{3}) = \frac{5}{3}$. Therefore the point $(\frac{2}{3}, \frac{5}{3})$ is indeed on the graph of the function $g(x)$.

0.2:7 For the graph of the linear function $f(x) = 9x + 3$, the y-intercept is the point $(0, 3)$ and the x-intercept is the point $(-\frac{1}{3}, 0)$.

0.2:16 The amount the landowner will receive for x thousand cubic feet of gas extracted from her land is given by the function $f(x) = 5000 + x/10$ (in dollars).

0.2:17 The total amount paid for t days in the hospital is $g(t) = 1500 + 300t$ (in dollars).

0.2:29 The graph of the function $f(x)$ is a horizontal line for at $y = 3$ for to the left of $x = 2$, and it becomes a line of slope one to the right of the point $(2, 5)$.

0.3:9 If $f(x) = \frac{x}{x-8}$ and $g(x) = \frac{-x}{x-4}$ then $f(x) + g(x) = \frac{x(x-4)-x(x-8)}{(x-8)(x-4)} = \frac{4x}{x^2-12x+32}$.

0.3:34 (graded) If $g(t) = t^3 - 5$ then $\frac{g(t+h)-g(t)}{h} = \frac{(t+h)^3-5-t^3+5}{h} = 3t^2 + 3th + h^2$.

0.3:37 The function $h(x) = f(g(x)) = x + \frac{1}{8}$ converts from British sizes to U.S. sizes.

0.4:3 The quadratic function $f(t) = 4t^2 - 12t + 9$ has a double root at $t = 3/2$.

0.4:19 The factored form of the polynomial $30 - 4x - 2x^2$ equals $-2(x+5)(x-3)$.

0.4:29 The x-coordinates of the intersection points of the curve of $f(x) = x^3 - 3x^2 + x$ with the curve of $g(x) = x^2 - 3x$ are the zeros of the function $f(x) - g(x) = x^3 - 4x^2 + 4x = x(x-2)^2$. The zeros are $x = 0$ and $x = 2$. Now, the intersection points of the two curves are found to be $(0, 0)$ and $(2, -2)$.

0.4:40 (graded) The distance traveled after slamming the breaks equals $f(x) = x + \frac{1}{20}x^2$ (in feet). The quadratic equation $f(x) = 175$ has the two solutions $x = 50$ and $x = -70$. Only the first solution makes sense since the speed x (in miles per hour) was positive. Hence the car was moving fifty miles per hour.

0.5:11 We have $(0.000001)^{1/3} = (10^{-6})^{1/3} = 10^{-2} = 0.001$.

0.5:37 We have $(8/27)^{2/3} = (2^3/3^3)^{2/3} = \big((2^3)^{2/3}/(3^3)^{2/3}\big) = 2^2/3^2 = 4/9$.

0.5:50 We have $\sqrt{1+x} \cdot (1+x)^{3/2} = (1+x)^{1/2} \cdot (1+x)^{3/2} = (1+x)^{(1/2+3/2)} = (1+x)^2 = x^2 + 2x + 1$.

0.5:93 We apply the formula on top of page 44 with $P = 1000$, $i = 0.068$ and $n = 18$ to see that on her 18th birthday, the investment will be worth $1000 \cdot (1.068)^{18} = 3268$ dollars.

0.6:13 Let r be the radius of the circular side and h the hight of the cylinder, all measured in inches. The volume of the cylinder equals $\pi r^2 h = 100$ (cubic inches). The cost of the material to construct the cylinder is $5\pi r^2 + 6\pi r^2 + 7 \cdot 2\pi r h = 11\pi r^2 + 14\pi r h$ (dollars).

0.6:19 If w is the width of the rectangle then its perimeter is $3w + w + 3w + w = 8w = 40$ cm. Hence the width is $w = 5$ cm. The area of the rectangle, which is hight times width, is found to be $w \cdot (3w) = 3w^2 = 75\,\text{cm}^2$.

0.6:20 Let r be the radius of the circular side and h the hight of the cylinder. It is assumed that $h = 2r$. The volume equals $\pi r^2 h = 2\pi r^3 = 54\pi$ cubic inches. This implies that the radius is $r = 3$ inches. The surface area is $2\pi r^2 + 2\pi r h = 6\pi r^2 = 54\pi$ square inches.

0.6:39 To "find $C(400)$" we intersect the given blue graph with the vertical line that passes through $x = 400$ on the x-axis. Then we draw a horizontal line through that intersection point. The value $C(400)$ is the position on the y-axis which lies on that horizontal line.