Solutions to 2.6: 47, 56, 58, 64, 27, 28, 29. 2.7: 19, 20, 29, 30

(47) We're given in the problem that $P' = 0.08P$ and that $P(0) = 2000$. By Theorem 14 we find that $P(t) = 2000e^{0.08t}$. Plugging in 10, we find that $P(10) \approx 4451$.

(56) We're given that $x(t) = 1 + t + Ae^t$. Taking the derivative with respect to t, $(\frac{dx}{dt})$, $x'(t) = 1 + Ae^t$. Since $x - t = 1 + Ae^t$, $x(t)$ is a solution to the DE $x - 1 = x'$.

(58) Let A and B be constants, and let $y(x) = A\ln(x)+B+x$. $y'(x) = A/x+1$, and $y''(x) = -A/x^2$. Then $xy'' + y' = x(-A/x^2) + A/x + 1 = -A/x + A/x + 1 = 1$, so $y(x)$ is a solution to the DE $xy'' + y' = 1$.

(64) Let $M(t)$ denote the amount of mold at time t. Since the rate of growth is proportional to the amount present, $M' = kM$ for some constant k. We also know that $M(0) = 2$ and $M(2) = 5$. A solution to this DE will be given by $M(t) = 2e^{kt}$, so we must find k. Since $5 = M(2) = 2e^{2k}$, taking ln() of both sides gives $\ln(5) = \ln(2e^{2k}) = \ln(2) + \ln(e^{2k}) = \ln(2) + 2k$. Thus $k = \ln(5)/\ln(2)/2 = \ln(5/2)/2$, and $M(t) = 2e^{t\ln(5/2)/2} = 2(5/2)^{t/2}$, and $M(8) = 78.125$ grams.

(27) Let $f(x) = 2e^x+\pi$. Then the antiderivative of $f(x)$ is $F(x) = 2e^x+\pi x+C$.

(28) Let $f(x) = e^x + x^e + e$. Then the antiderivative of $f(x)$ is $F(x) = e^x + \frac{1}{e+1}x^{e+1} + ex + C$.

(29) Let $f(x) = 2^x+x^2+2$. Then the antiderivative of $f(x)$ is $F(x) = \frac{1}{\ln(2)}2^x + \frac{1}{3}x^3 + 2x + C$.

(18) Let $f(x) = 3\cos(x)$. Then $f'(x) = -3\sin(x)$.

(20) Let $f(x) = \cos(2x)$. Then $f'(x) = -2\sin(2x)$.

(29) Let $f(x) = 2\sin(x)$. Then the antiderivative of $f(x)$ is $F(x) = -2\cos(x)+C$.

(30) Let $f(x) = 3\cos(x)$. Then the antiderivative of $f(x)$ is $F(x) = 3\sin(x)+C$.